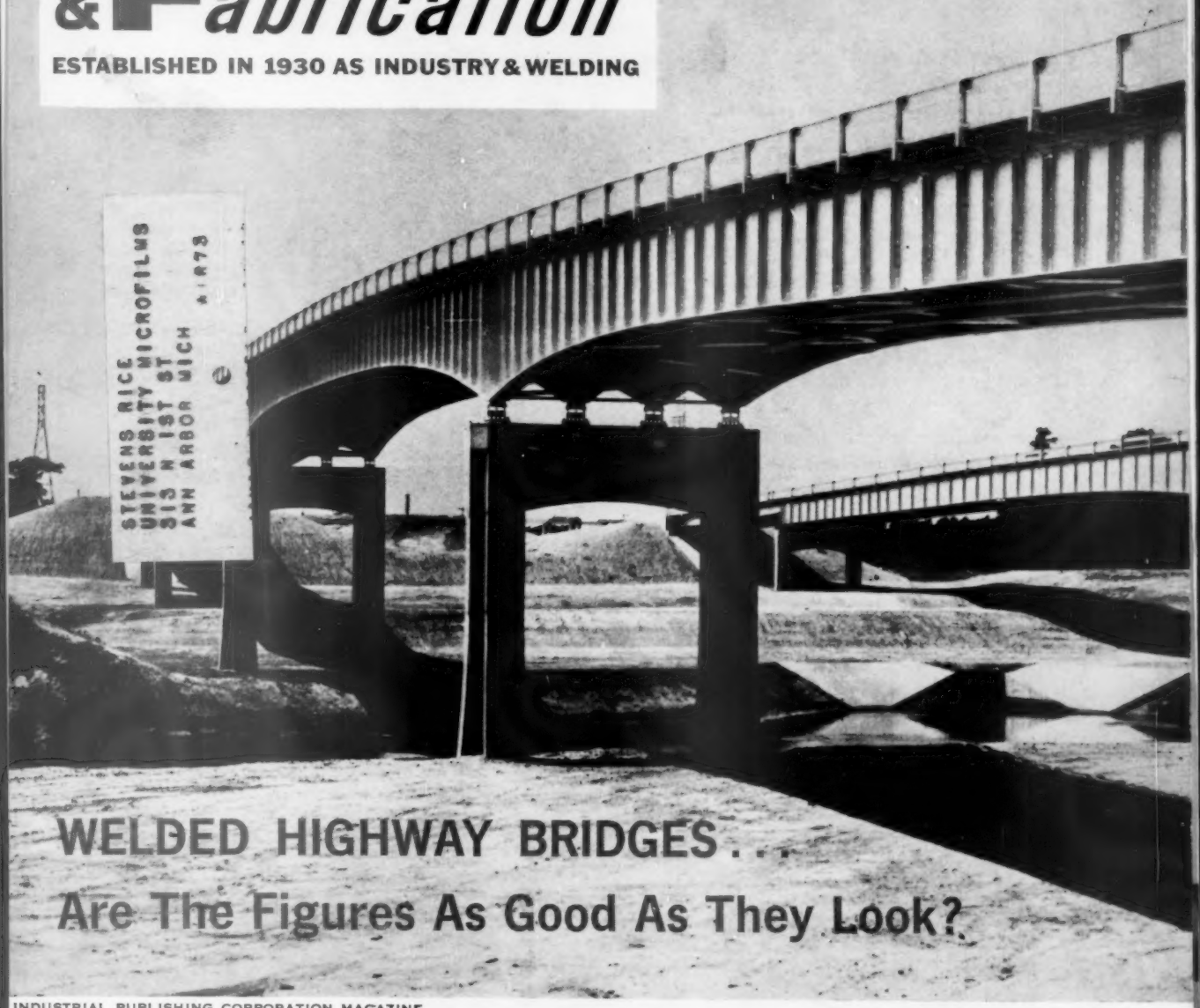
Welding Design & Fabrication

AUGUST 1960

ESTABLISHED IN 1930 AS INDUSTRY & WELDING

STEVENS RICE
UNIVERSITY MICROFILMS
313 N 1ST ST
ANN ARBOR MICH



WELDED HIGHWAY BRIDGES . . .
Are The Figures As Good As They Look?

INDUSTRIAL PUBLISHING CORPORATION MAGAZINE

ALSO IN THIS ISSUE

NEED 400 WELDING ARCS? USE ONLY 10 POWER SOURCES

WELDED SKYSCRAPER IS 17% CHEAPER THAN A BOLTED ONE

THE IMPACT OF CRYOGENICS ON THE WELDING INDUSTRY

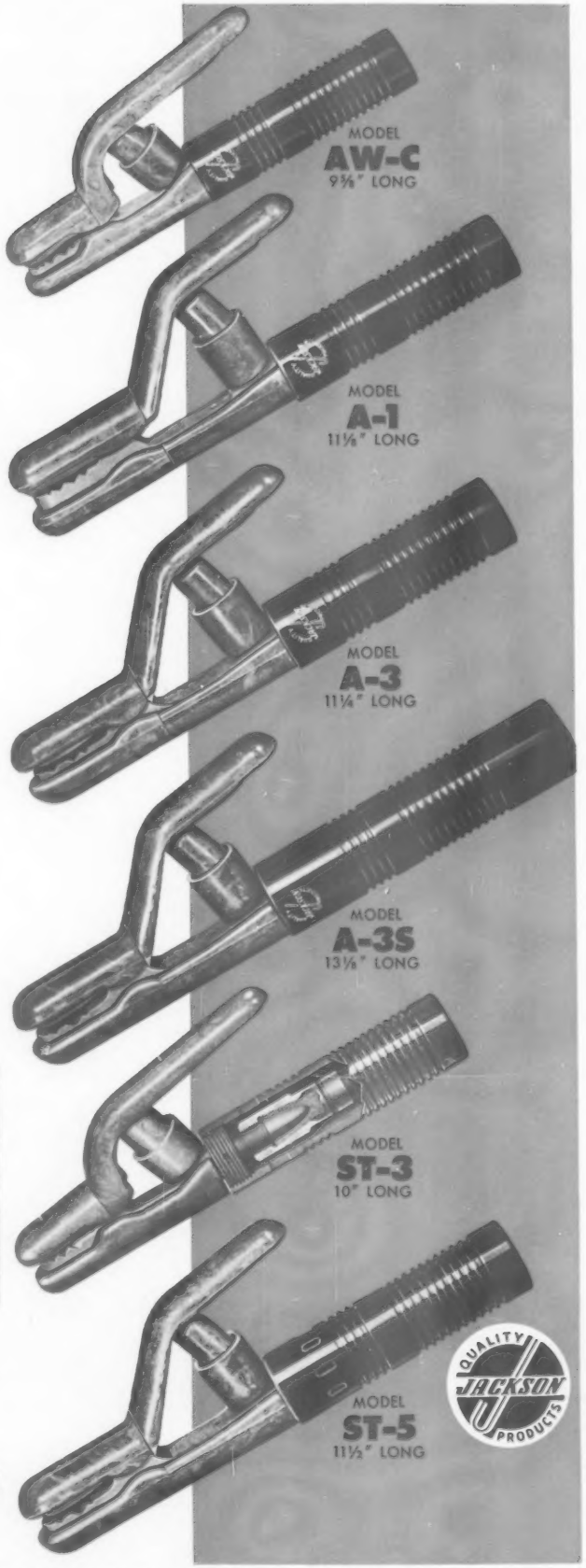
Which ? is for ? YOU?

The Correct Choice is Easy with Duty-Cycle Rated Jackson Holders

Figure the percentage of arc time in an average ten minute period of work. That's the duty-cycle your job requires. Use this important factor in determining which holder you require. Be guided by it as well as by your electrode diameter, amps, and cable size requirements. The capability of a holder to perform your duty-cycle is very important to its long, satisfactory service life.

All the Jackson holders listed are insulated copper-alloy holders. The ST-series holders feature the new trouble-free Sealed Tight cable connection device. For lighter duty-cycles, use Jackson's aluminum-alloy Featherlight electrode holders. See all the Jackson holders at your distributor. Ask for the Jackson Catalog.

Holder Class	Model Number	Electrode Size	Amperage	Cable Size	Duty Cycle
SMALL	AW-C	7/32"	250 300	1 1/0	50%
MEDIUM	A-1 & ST-3	1/4"	300 350	1/0 2/0	50%
LARGE	A-3 & ST-5	3/8"	375 450	2/0 3/0	65%
HEAVY-DUTY	A-3S	3/8"	500	4/0	80%



Sold Everywhere by Better Welding Supply Distributors

Jackson Products

AIR REDUCTION SALES CO., A DIVISION OF AIR REDUCTION CO., INC.

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For More Information Circle No. 47 on Reader Service Card.

Circle No. 44 on Reader Service Card. ⟶

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Consider the future. Select equipment that keeps ahead of obsolescence. Today you may weld mild steel. Next year it may be high strength steel, or perhaps aluminum. Five years from now...who knows? With new welding advances being made every day, you must stay ahead of the field."

PLAN AHEAD with HOBART

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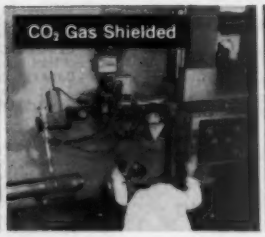
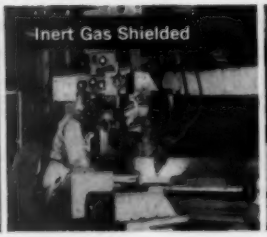
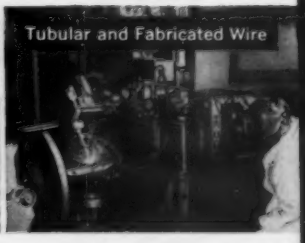
Ask for Illustrated Bulletin covering latest automatic welding process.







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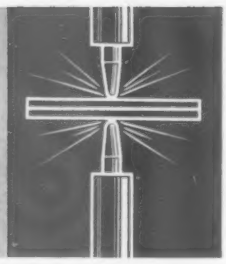
"Manufacturers of the world's most complete line of arc welding equipment"

P R MALLORY & CO Inc

MALLORY MEMOS

NEWS AND TIPS ON RESISTANCE WELDING

Mallory Metallurgical Company, Indianapolis 6, Indiana

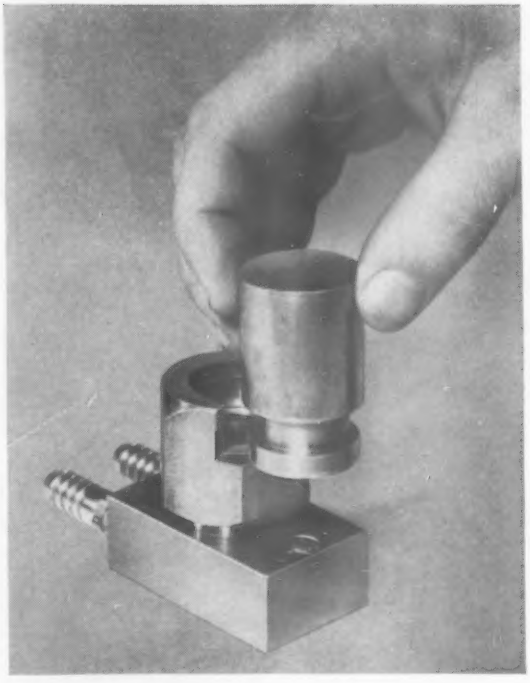


Change electrodes in seconds with the MALLORY *Nu-Twist*® system

Changing electrodes was never so easy. Turn a hex nut, slip out the old electrode, insert the new one, tighten the nut and you're ready to resume production. Electrodes are always positioned correctly, both in radial alignment and in height.

See for yourself how you can reduce downtime by using the Mallory "Nu-Twist" system . . . an engineered combination of electrodes, holders and adapters that fits a wide range of single and multiple welding jobs. **Call your Mallory distributor for a copy of our new bulletin.**

Equalizing pressures on multiple welds. Mallory hydraulic equalizing adapters provide equal welding forces at the electrodes, with hydraulic interconnection of two or more units. This makes it possible to expand the capacity of a single-spot welder by converting it to a multi-spot machine . . . in both press type spot welders and projection welders. In multiples, this also makes an excellent equalizing set-up for large, irregular or multi-piece projection welding jobs.



See These Mallory Distributors For *Nu-Twist*® Products

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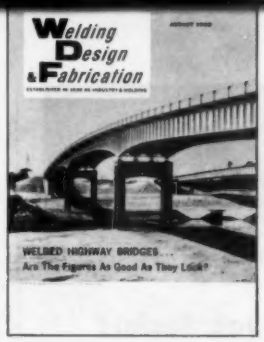

for August, 1960

COVER: The longest welded girders in the country are now those in the central 270-foot spans of twin bridges across Buffalo Bayou in Houston, Texas. The adjacent anchor arm spans in the Texas bridge are 199 feet. General contractor and erector was Elmer C. Gardner, Inc., Houston; bridges were designed and constructed under supervision of A. C. Kyser, engineer-manager of the Houston Urban Project of the Texas State Highway Department. American Bridge fabricated the girders.

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FEATURES

23 WELDED HIGHWAY BRIDGES: ARE THE FIGURES AS GOOD AS THEY LOOK?
Forty-three states are now building welded highway bridges, but only one out of every three bridges they build is welded.

29 BLANKET BRAZING DISHED HONEYCOMB PANELS
Electric blanket brazing is cheaper and more versatile for brazing stainless steel honeycomb panels with compound contours.

30 NEED 400 WELDING ARCS? USE ONLY 10 POWER SOURCES
A big expansion program for generating plants called for hundreds of welding arcs. The solution was to use multi-operator equipment.

32 SIX ADVANTAGES OF CAST-WELD DESIGN
A steel casting-tubing weldment eliminated three separate patterns needed for cast iron parts, reduced rejections, and eliminated extensive inventories.

36 THE IMPACT OF CYROGENICS ON THE WELDING INDUSTRY
Using low temperature processing (cryogenics) to turn gases into liquids, makes it easier to manufacture, store and handle them.

42 NEW BRAZED DESIGN MAKES STRONGER ROCKET CHAMBERS
A switch from a tube-type thrust chamber to one of thin channels wrapped in metal ribbon and brazed yielded a stronger, lighter, cheaper unit.

44 WELDED BUILDING IS 17% CHEAPER THAN A BOLTED ONE
Eight steel contractors bid on a 31-story skyscraper. The contractor who recommended welding won out over those suggesting riveting and bolting.

49 RESISTANCE WELDING MAKES DOUBLE-DUTY PARTS
Redesign of an aircraft floor panel provided protection for hydraulic tubing. Using the tubing as a structural member made panels strong and rigid.

50 ALLOY SPRINGS MAKE DIP BRAZING FASTER, MORE ACCURATE
Successful dip brazing of precision aluminum assemblies is made possible by a new alloy spring material that withstands hundreds of dips in a 1,400°F brazing bath.

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By the Manufacturers of Famous

ATLAS | WIDE-BLADE TOMAHAWKS

WORLDS LEADING WELD CLEANING TOOLS

4 NEW ACCESSORIES

To Make The Welder's Job Easier!

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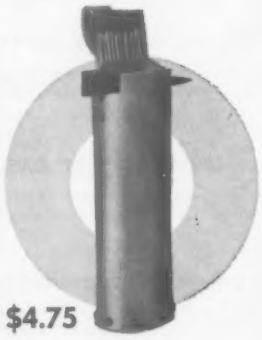
MODEL 19 HOLDS ANY KIND OF HAMMER

$1.95

Holster made of heavy full grain saddle leather with belt loop adjustable to 5 lengths. For welders, plumbers, carpenters, millwrights.

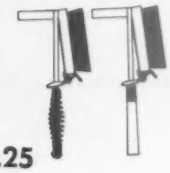
MODEL 192 DUAL CASE HOLDS TOMAHAWK & 10 LBS. WELDING RODS

A supply of rods and the Atlas Tomahawk of your choice at your side where you can grab them without even looking. This case has a flat bottom and will stand if you choose not to wear it while working. Heavy full grain saddle leather.



$4.75

MODEL 21 FOR CARRYING ANY COMBINATION WELD CLEANING TOOL



Holds Atlas "Dual Tool" or any chipper-brush tool. Protects the welder's fingers and clothing. Prevents brush getting frayed. 5 adjustments on belt loop. Heavy full grain saddle leather.

$3.25

MODEL 15 SAFETY BELT

Heavy webbing with rust proof ring and snap. Wear it over your coveralls as a belt or shoulder strap to carry equipment.

$2.25

Tough as they come!

Atlas makes 33 different weld cleaning tools. There's one for every purpose and preference—Ask your welding supply dealer to show them to you.

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Cooler Head Protection AO 9702W Helmet

This helmet's cooler because it reflects 70% of radiant heat. That's why we call it "Weld-Cool". White exterior, curved chin, aluminum glass holder, stationary front. Inside of helmet is black. Aluminized plastic coverplate supplied for extra coolness in eye area.

Maximum Eye Protection AO 3081A Goggle

For use under helmets (and for welders' helpers, furnace men, molders, brazers). Strong leather-covered bridge and leather side shields. 50 mm. regular Super Armorplate, clear or Calobar in medium, dark or extra dark shades. For both impact and light ray protection.

Efficient Respiratory Protection AO R5056 Respirator

Very low breathing resistance — compact filters are very efficient. Approved by the BUREAU OF MINES for All Dusts, Mists and Fumes. Highly recommended against metal fumes in welding, cutting and burning work.

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Chrome-tanned cowhide. Bib is detachable — attaches to cape with snap fasteners. All seams double cotton stitched and steel sewed. Ends of seams reinforced with steel staples. Anchor button at each armpit keeps cape securely buttoned.

Lightweight Hand Protection SCTX200 Glove

Special chrome-tanned split cowhide leather. Gunn style, 14" overall. Flat seam double stitched at base of palm. One-piece back. Wing thumb. The light weight of this glove adds to welding efficiency.

Always insist on AO Trademarked Safety Products

Safety Service Centers in Principal Cities

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Your Surest Protection . . . AO SURE-GUARD Products

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WELDING AT WORK

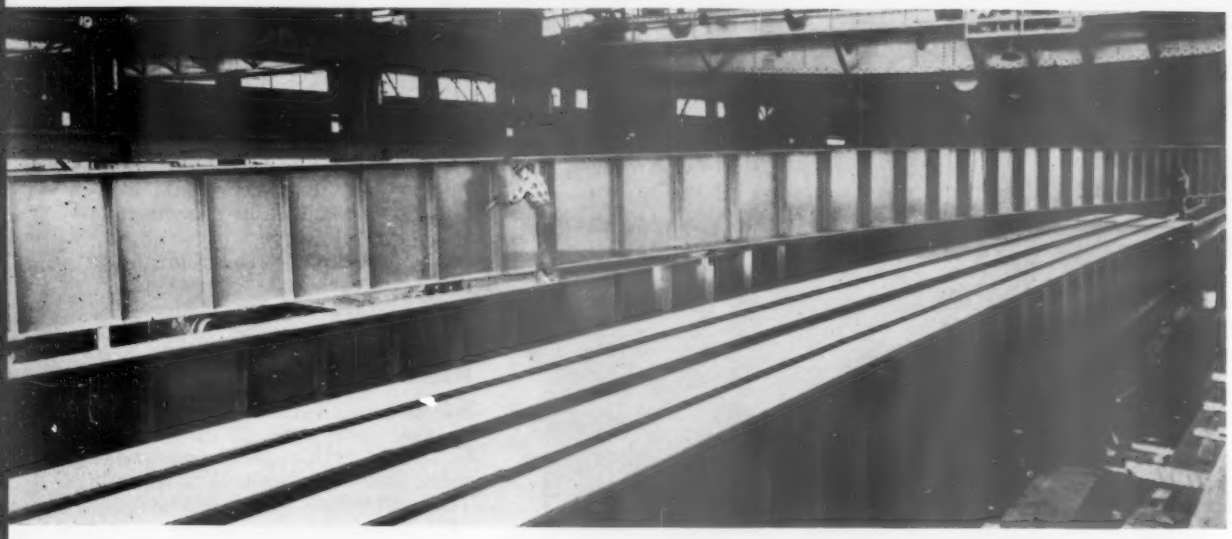
to do the job better and cheaper

Put argon in your pipe . . . and weld it

AVON LAKE, OHIO: Expansion of Cleveland Electric Illuminating Company's power plant here called for 154 Heliarc welds in stainless steel steam and reheat piping.

To provide inert gas shielding within the pipe, two air balloons were inflated, one on either side of the joint. Argon was then pumped in to displace the air and protect the weld from contamination. The balloons inflated tightly against the pipe inner wall, blocking gas flow and keeping argon cost low. A consumable insert ring was Heliarc welded between the abutting pipe sections to provide a tight joint.

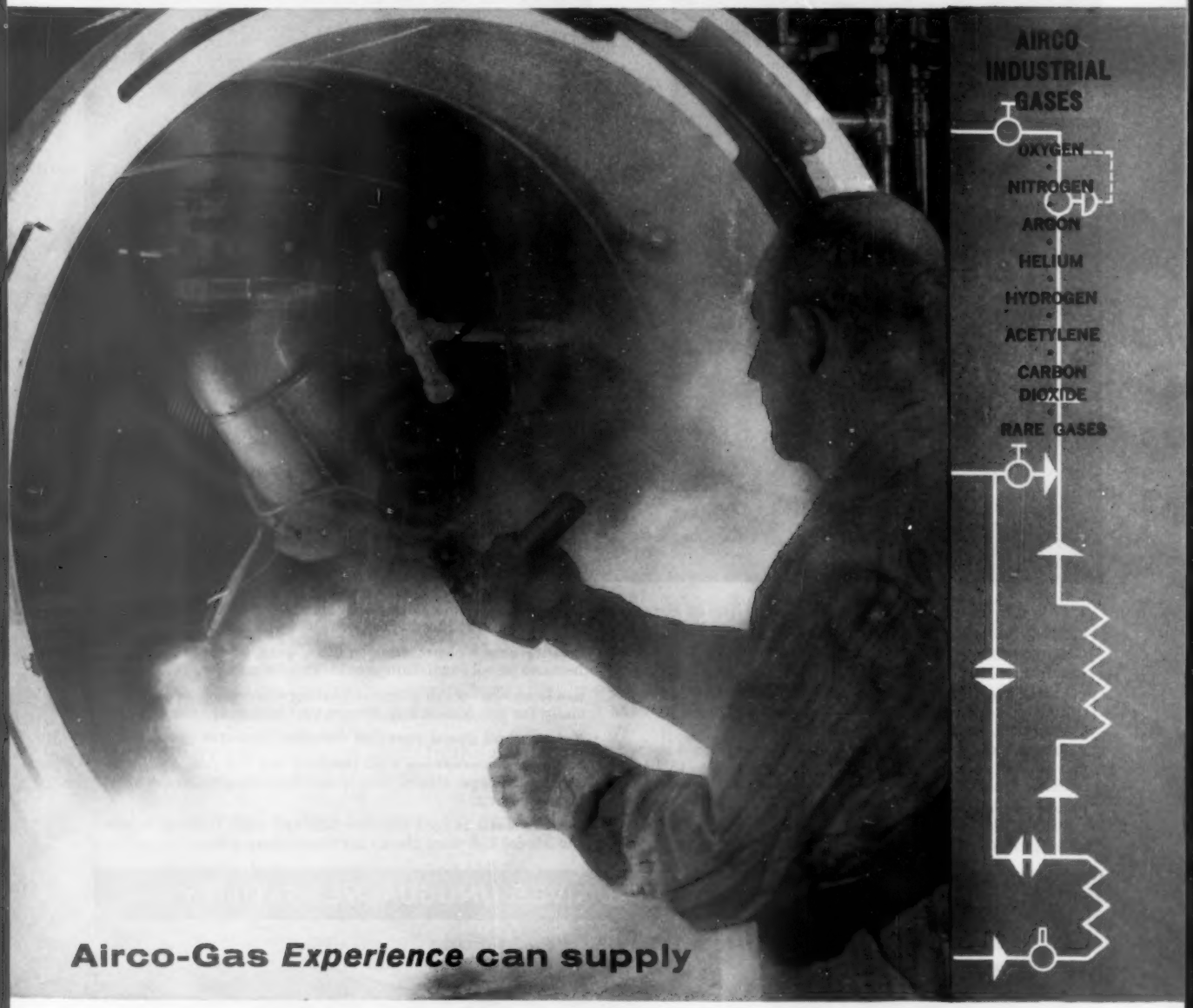
The contractor was Pittsburgh Piping and Equipment Co., Pittsburgh.



Giant welded plate girders are 131 feet long

CLEVELAND, OHIO: These giant welded plate girders were fabricated and erected by Builders Structural Steel Company for overpasses on Ohio's North-South Thruway. Webs in the girders are made of three lengths of Jones & Laughlin Steel Corporation's steel plate (ASTM A-373). The 66 web stiffeners on each girder were cut from J & L steel plate and welded by the submerged arc process, using a manually guided, self-propelled Lincoln welder. Longitudinal welds for the flanges were made automatically.

A missile component is being tested here at minus 300°F in an atmosphere of Airco nitrogen. An environment has been created — by an Airco gas — that is as rugged as ultimately the missile itself will find.



Airco-Gas *Experience* can supply

unusual environments, such as minus 300°F

Want unusually low temperatures for testing, treating or storing? Airco nitrogen gas—as low as minus 320°F — is what you are looking for. And if your requirements go just the other way — if you need over six thousand degrees for welding or cutting — there, too, Airco gases will serve you.

Yes, for any industry . . . and for any requirement, Airco Industrial Gases — backed by Airco's experience—are at your service. For information, call your nearest Airco office.

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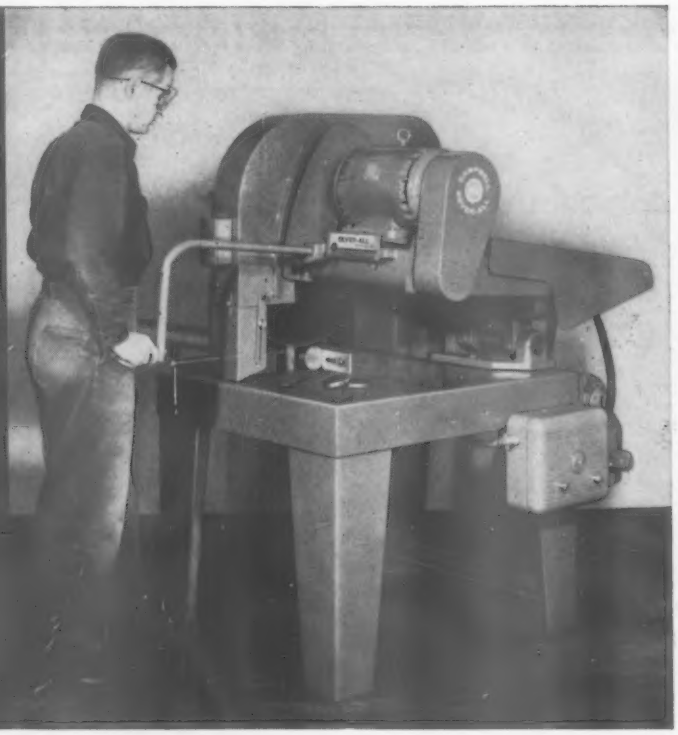
GREATEST CUT-OFF CAPACITY IN ITS CLASS!



• This newest addition to the Sever-All line of abrasive cutting machines—the Model 2-A—provides greater cutting capacity and more flexibility than any other machine in its class. Check these important advantages:

Big capacity • cuts 4″ round or square solids, 6″ diameter tubing or standard pipe, 6″ x 1″ flat stock, 6″ angle iron and 8″ channels. Cuts practically all metals.

Fast operation • accurate cuts at the rate of 2 to 3 seconds per square inch. For instance, you can cut a 4″ bar of hardened steel in 45 seconds, or a 2″ pipe in 3 seconds.

Power oscillation • oscillation—the forward and backward motion of the cutting wheel as it is fed down into the cut—gives you extra cutting capacity without excessive horsepower load on your power lines. It also contributes to longer wheel life and reduced operator fatigue.

Quality cuts • clean, smooth cuts, even on large sections, because wheel oscillation provides cooler cutting action.

Economy • Sever-All abrasive cutting wheels, developed specially for the Model 2-A, assure you of lowest cost per cut.

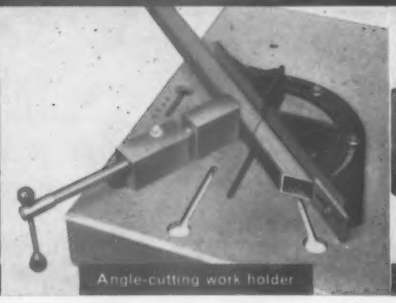
Safe • wheel guard provides complete operator protection.

Minimum maintenance • all bearings are the pre-lubricated and sealed type. Clean, simple machine design permits easy housekeeping.

Built to last • rugged machine bed and rigid castings make the Model 2-A first choice for heavy-duty jobs.

VARIETY OF WORK HOLDERS GIVES UNUSUAL VERSATILITY

V-block with quick-action clamp



Angle-cutting work holder

2-way clamp for irregular shapes

Choose the work holders you need from several optional arrangements. These include the vise-type holder shown on the machine at top, plus the V-block, angle-cutting and 2-way clamp fixtures above. All fit interchangeably on the Model 2-A Sever-All. Screw-type and quick-action clamping also may be used interchangeably.

***Write for details** on the new Model 2-A Sever-All abrasive cutting machine. Ask for Bulletin DH-299*

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SEVER-ALL ABRASIVE CUTTING MACHINES

Allison-Campbell Division, American Chain & Cable Company, Inc.

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The advantages are actually many and unique. First of all, the high quality of the products will stimulate repeat buying and assure lasting satisfaction to seller and purchaser alike.

The prices are competitive with other quality products. The discounts are equally fair and equitable.

But—here are other important reasons why we offer you great advantages:

We do not manufacture or sell gases; therefore, cannot compete against you. We do not sell retail except within the immediate San Francisco area. Here, a few selected large users are served, for the purpose of having personal contact with field needs, watching our products in actual service, evaluating the merits of new designs and talking directly with expert operators to learn firsthand how our products stand up in service.

With this exception, we do not compete against you in any manner, believing your efforts to expand should be rewarded by our faithfulness.

Our lines are very complete, both in the welding and flame cutting apparatus, as well as items for hospitals and operating rooms—both fields of which you may wish to serve if you sell gases.

We have been in business for over fifty years as a user, as a designer and manufacturer of high quality precision equipment and this will give you added assurance that we are capable of understanding your needs and know how to work with you satisfactorily.

We yet have good territories open and cordially invite your inquiry.

559

NATIONAL welding equipment company... 218 fremont street san francisco 5 california

For More Information Circle No. 59 on Reader Service Card.

WELDING MANAGEMENT

watches these developments

WELDING DESIGN & FABRICATION'S president, Lester P. Aurbach (left) hands $500 award to Thomas Ross, first winner of The Industrial Publishing Corporation's Work Scholarship Award. The annual award, established this year in recognition of the company's 30th anniversary, is intended to point up career opportunities in the business press to young men with technical educations. It is open to juniors at six engineering colleges: M.I.T., Rensselaer, Ohio State, Case, Purdue, and Carnegie Tech. Winners get the cash award plus 10-weeks summer employment.

Ross, an aeronautical engineering student from Indianapolis, chose to work on WELDING DESIGN & FABRICATION. He was president of his junior class at Purdue.

PLAGUED with equipment shortages and high operating costs in steel fabrication, construction, and erection?

A cost-saving equipment rental plan, just inaugurated by R. C. Mahon Company, Detroit, may be your answer.

Equipment available includes light units—hydraulic jacks, welding units, air compressors—and heavy equipment—25-ton truck cranes, 50-ton stiff-leg derricks and 80- to 100-ton special crawler cranes with 150-foot booms.

A WEALTH OF GRINDING AND FINISHING experience is available to any company in the country for analyzing grinding and finishing operations. Minnesota Mining and Manufacturing Company's *Cost Check* 5-4-5 program is intended to show industry how coated abrasives can work faster, better, and cheaper than any other method. When asked for help, the firm will make recommendations to help reduce costs, provide better finish, or increase production.

SALES OF METAL-FABRICATED nuclear components and equipment reached $101.9 million in 1958 according to statistics just released by the Atomic Industrial Forum, the association of the nuclear industry. The report lists the following major groupings under reactor components and equipment: reactor vesse's and tanks, auxiliary tanks and pressurizers, safety and vapor containment vessels, fuel handling equipment, control rod drive mechanisms, steam generators, condensers, heat exchangers, coolant circulators, valves, piping and tubing, fittings and hangars, filtration and purification equipment.

A NEW, HIGH-STRENGTH, corrosion-resistant alloy that includes many of the desired qualities of silicon bronze or Everdur has been introduced by American Brass Co. "Cunisil-837" is an alloy of 97.50 copper, 1.90 nickel and 0.60 silicon. The company says it is intended for certain end uses where its particular combination of physical, mechanical and fabrication properties is needed. It has high tensile strength, high yield strength, high electrical conductivity (30-42% IACS as heat treated), high corrosion resistance and excellent cold-forming characteristics before the hardening heat treatment.

PRODUCTION OF STEEL totaled 8,832,000 net tons of ingots and steel for castings during May, and 53,350,750 tons during the first five months of 1960, according to the American Iron and Steel Institute. The May production compared with 9,777,857 tons made during April, 1960, and 11,600,581 tons made in May, 1959.

The five month total was 19,819 tons lower than in the corresponding part of last year when the output was a record 53,370,569 tons.

A NUMBER OF REFRACTORY METALS and metallic compounds are now being grown in the form of large, single crystals, according to Linde Company, Division of Union Carbide Corp. A new, arc fusion crystal growing process has been developed and used to grow refractory crystals such as tungsten, molybdenum, tantalum, columbium, and vanadium. The crystals are produced as cylinders in diameters of ¼ inch to 1 inch and from a few inches to over a foot long. Tungsten crystals ¾ inch in diameter and 12 inches long are being made.

These single crystals have greater ductility than a polycrystalline structure and they contain relatively small amounts of impurities which minimizes brittleness caused by oxide inclusions. They can be formed and worked at temperatures significantly lower than those normally associated with the refractory group.

CLEARING HOUSE—

Torch Firm Sets a Scorching Pace

By JACK CLEARY

HARRIS CALORIFIC CO., Cleveland pioneer 57 years ago in manufacture of torches and allied equipment for the oxyacetylene metal cutting and welding industry, is fully living up to the second part of its name these days.

JACK CLEARY

The word calorific, according to Webster, means hot. And Harris Calorific certainly is making hot with its sales figures.

Clarence M. Taylor, president, reveals that the company's world-wide net sales for this year's first quarter set a new record . . . . . a 42% gain over the like 1959 period.

This comes on top of a 41.5% sales gain for the full year 1959.

For domestic sales alone, the sales increase last year amounted to a husky 52%.

The late John Harris, the firm's founder and first president, accidentally discovered the principle of oxygen flame cutting of metal while experimenting with synthetic rubies shortly after the turn of the century. However, Harris Calorific has remained relatively small in an industry which now includes several giants.

High Rate of Growth

But the current growth—more than a 40% rate—is well ahead of the industry's average of 17% for last year.

This is attributed to development of newly designed equipment for faster and more economical metal flame cutting and to expansion of the company's distribution network.

Lei[illegible] P[illegible]ins, [illegible]
dr[illegible]

HARRIS' SALES GAIN 42% IN FIRST QUARTER

...and May 1960 was the biggest month in its 57-year history....

There are a lot of good reasons for this 1960 vs. 1959 performance

More and more users of welding and cutting apparatus are turning to Harris. As a prime source for the new and the practical in this field, Harris strives to think like its customers, and develop what they require for efficient, low cost operations.

Leadership has resulted from such newly designed apparatus as the industry's first gaugeless regulator; the first automatic welding torch; the first multi-stage regulator; the first oxypropane cutting torch; the first efficient oxy-natural gas cutting torch; Cut-o-mation; as well as a host of other progressive contributions.

More new Harris developments are coming out of an aggressive, continuing research program, which will be of benefit to industry all over the world.

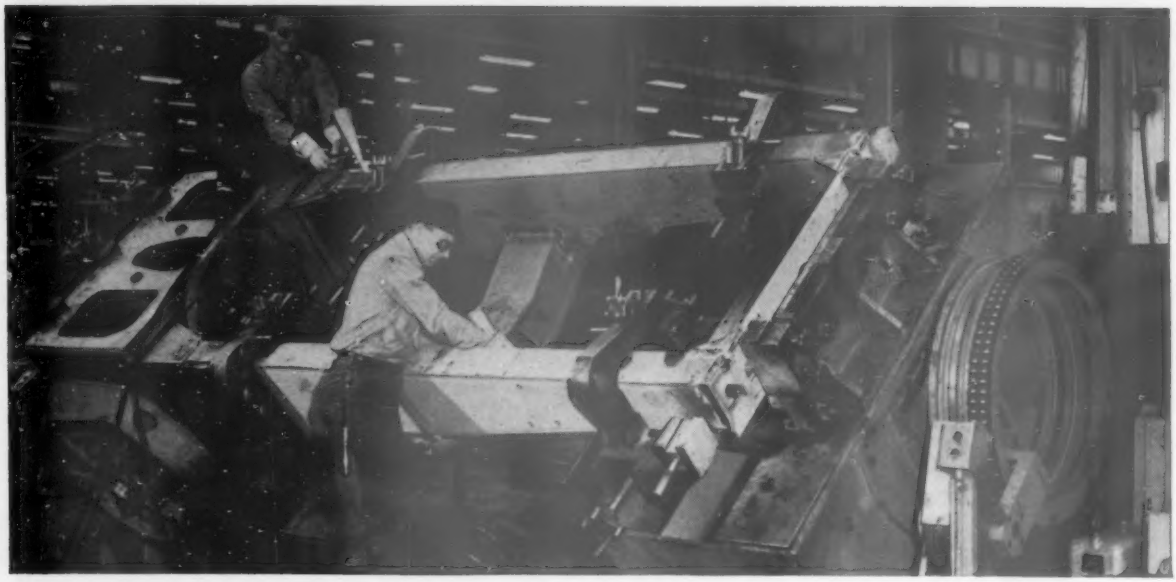
HARRIS

8110-HC

Building World-wide Customer Confidence with Advanced Design Welding and Cutting Apparatus

THE HARRIS CALORIFIC COMPANY, 5501 CASS AVENUE, CLEVELAND 2, OHIO

For More Information Circle No. 43 on Reader Service Card.



There's more to Welding Wire than the analysis

Particular welding jobs call for particular welding wires—and you might think that one wire is as good as another so long as it has the right chemical analysis. But there's more to it than that.

Take Caterpillar Tractor Co., for example, which is a large consumer of welding material. Just identifying and using the correct analysis isn't enough. Caterpillar also requires efficient packaging and coiling—uniform temper and finish—consistent metallurgical characteristics. In fact, it is at Caterpillar's suggestion that PAGE now color-codes coils for quick identification. Caterpillar uses PAGE welding wire because it meets the requirements—regularly. In your own welding operations, you can count on the same high standards when you specify PAGE.

This tractor is typical of the hard-working, dependable products made by Caterpillar. PAGE **Analysis 8620** is used to obtain high strength welds with maximum ductility on alloy steel.

Let PAGE Help Solve Your Welding Problems

These Folders can help you

Write for:

Folder DH-402-C Contains information on submerged arc and inert gas automatic welding wire. Lists descriptions and uses of the many PAGE analyses. Describes our extensive variety of packaging. Illustrated.

Folder DH-1218 • Chart lists detailed analyses of PAGE automatic welding wires, metal spray wires, bare electrodes and gas welding rods. Shows uses and physical properties. Lists most competitive makes.

When you bring your welding problems to PAGE, you get the benefit of over half a century of wire drawing experience and leadership in metallurgical research. Leadership evidenced by the industry's widest range of analyses —33 grades designed to do an endless variety of welding jobs. Let PAGE help you improve your quality and lower your costs by furnishing the right wire for your job.

PAGE wire packaging is designed to give you the utmost in convenient storage and handling, whether you require a 1# spool or a 1200# payoff-pallet. Prompt delivery is assured from a coast-to-coast network of PAGE distributors backed up by strategically located PAGE warehouses.

You will find it in "good business" to bring your problems to PAGE.

ACCO

PAGE WELDING WIRE

Page Steel and Wire Division • American Chain & Cable Company, Inc.

Monessen, Pa.*, Atlanta, Chicago*, Denver*, Detroit, Houston*, Los Angeles*, New York, Philadelphia*, Portland, Ore., San Francisco*, Bridgeport, Conn.

*Indicates PAGE warehouse stocks

PAGE—THE SOURCE FOR ANSWERS TO WELDING PROBLEMS

For More Information Circle No. 61 on Reader Service Card.

Tack welding cast iron cones to carbon steel vortex tubes of gas scrubber. Ni-Rod "55" Electrodes make ductile, crack-free joints. Scrubbers made by The Aerotec Corp., Greenwich, Conn.

Weld cast iron to carbon steel...no preheat... no cracking...with Ni-Rod "55" Electrode

Joints were cracking up – between cast iron cones and carbon steel tubes in gas scrubbers like this one.

Welds made with carbon steel electrodes were just too brittle. They cracked when slag was chipped away. They sometimes broke entirely from rough handling in shipping.

Then – Aerotec weldors switched to Ni-Rod "55"* Electrodes, specially developed by Inco for welding cast irons. And what a difference – no more cracked welds . . . no more preheating . . . good penetration. And Aerotec finds that with Ni-Rod "55", any weldor of normal skill can do a better job.

Get trouble-free welds between cast iron and ferrous or non-ferrous metals – with Ni-Rod "55" Electrode, available from most distributors.

You'll see a lot of ways other shops have pared costs in our booklet, "Repair Cast Iron Parts Quickly and Easily". Yours for the asking. *Inco trademark

HUNTINGTON ALLOY PRODUCTS DIVISION
The International Nickel Company, Inc.
Huntington 17, West Virginia

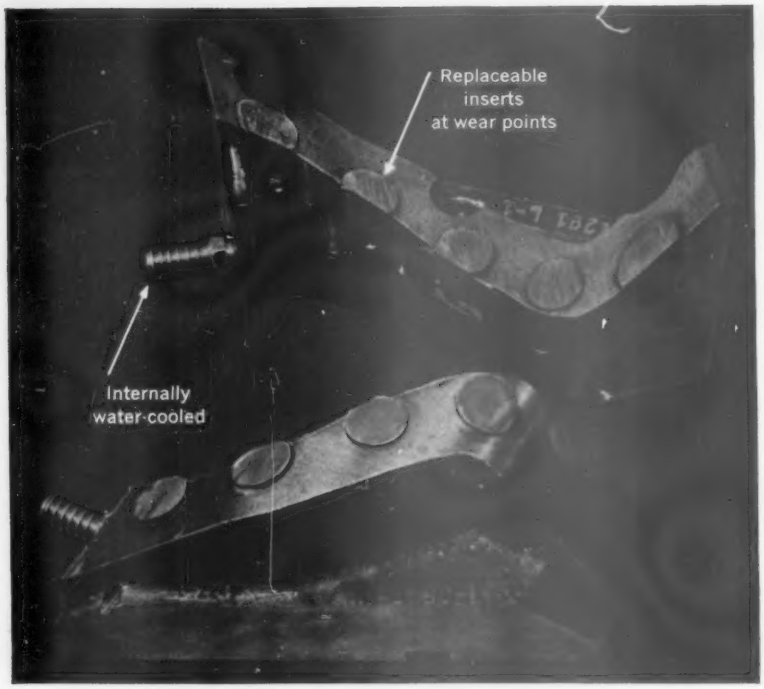
INCO WELDING PRODUCTS

electrodes • wires • fluxes

For More Information Circle No. 46 on Reader Service Card.

AMPCO®

7 times longer life for projection welding die!



Replacement time and cost reduced almost 75%!

Originally, the projection welding die shown here was cast to contour in one piece and not internally water-cooled. Its life was short. Replacement was expensive, in terms of both money and downtime.

Then Ampco's experience was drawn upon. Working surfaces were changed to incorporate relatively inexpensive refractory inserts which could be quickly replaced. Adequate water-cooling was provided, also. These two factors vastly increased die life.

Ampco has complete facilities and the know-how for making welding dies of all types — flash, butt, projection, and cross-wire. Your Ampco-Weld distributor can put them to work for you. Call him. Write for Bulletin RW-10.

RESISTANCE WELDING ALLOY ASSOCIATION RWA

RW-38

AMPCO METAL, INC., Dept. 177 H, Milwaukee 46, Wis.
West Coast Plant: Burbank, California • Southwest Plant: Garland (Dallas County), Texas

For More Information Circle No. 11 on Reader Service Card.

MEN ON THE MOVE

in the welding industry

APPOINTMENTS:

CLARK

SOLARZ

William C. Clark, Jr. has been appointed regional manager for the Eastern Region by Alloy Rods Co., York, Penna.

Rankin Manufacturing Company has named **William Solarz** to manage its Northeastern District. Solarz will make his headquarters in Cleveland, Ohio.

Dr. Glenn W. Oyler has been named head of the Welding Research and Development Department of M&C Nuclear, Inc., a subsidiary of Texas Instruments Inc., Attleboro, Mass. He will direct the development of new techniques for welding nuclear fuel elements and allied components.

Robert S. Ames has been appointed general manager of the Sonobond Division of Aeroprojects Inc., West Chester, Penna.

Ted Allen has joined Thermax Metallurgical, Inc. as a sales engineer for thermit welding. He will cover the Chicago area.

Standard Steel Corp., Los Angeles, Calif., has named **Thomas A. Carter, Jr.** manager of its Cryogenics Division.

Edward L. Maquire has been appointed Manager of Cryogenics for Uni-Flex Manufacturing and Engineering, Inc., Los Angeles. Maquire will co-ordinate engineered sales of cryogenic equipment.

continued on page 16

This New **PLUG-IN** Welder Control

Lets You

ADD CONTROL FUNCTIONS AS YOU NEED THEM

A Wide Range of Plug-In Units Enables You to Add Components as Your Welding Jobs Change

HERE'S HOW YOU CHANGE YOUR BASIC CONTROL SIMPLY BY ADDING PLUG-IN UNITS

FOR WELDING MILD STEEL— BASIC CONTROL INCLUDES THESE PLUG-IN UNITS:

3B Timer
Relay Valve Control
Tube Firing Panel

FOR WELDING ALUMINUM— YOU ALREADY HAVE:

3B Timer
Relay Valve Control
Tube Firing Panel

YOU ADD THESE PLUG-IN UNITS:

Heat Control
Up-down Slope
Forge Delay

Every feature you want —for every welding job

- **22 standard units provide "custom" control for every welding requirement**
- **all units are plug-in type for quick change**
- **available in "all electronic" or "relay firing" versions**
- **auxiliaries for all conventional welding functions**
- **circuits include the latest safety features**

Write for Bulletin SM-277 to Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin

SQUARE D COMPANY

wherever electricity is distributed and controlled

For More Information Circle No. 70 on Reader Service Card.

for every requirement

GB

Better Silver Brazing

GB Silver Brazing Alloys are available in all popular diameters, in coils, straight lengths, pre-formed rings and special shapes to satisfy every requirement, as well as in strip form. Quality controls assure you that the alloys will produce a strong, economical, dependable leak-proof joining of metals. The alloys meet all Standard Specifications.

These popular Goldsmith alloys will join Brass, Copper, Steel, Stainless Steel, Monel, Inconel, Silver and Gold.

Your operator will appreciate your specifying GB Silver Brazing Alloys for their fine working qualities.

For best results, use GB #88 Flux, known for its low glare and low fuming qualities—operator comfort assured, available in the following size containers—3 oz., ½ lb., 1 lb., 5 lb. jars, and 25 or 50 lb. drums. Call your dealer today. Complete data on request.

Goldsmith Bros.

DIVISION OF NATIONAL LEAD CO.

900 West 18th Street, Chicago 8, Illinois—NEW YORK • OAKLAND

For More Information Circle No. 39 on Reader Service Card.

continued from page 14

APPOINTMENTS:

Mario Camargo, Jr. has been named assistant export manager for All-State Welding Alloys Co., Inc., White Plains, N. Y.

Appointment of **Donald T. Offord** as sales engineer in the Chicago area has been announced by Wall Colmonoy Corp., Detroit.

Joseph J. Murphy has been named district representative in the Middle Atlantic States for Hobart Brothers Co., Troy, Ohio.

PROMOTIONS:

SKEIE

DOYLE

Magnaflux Corporation, Chicago, has announced three new national sales positions. **Kermit A. Skeie** is in charge of commercial inspection. **Denis P. Walsh** becomes manager of distributor and representative sales. **Robert G. Strother** is in charge of field engineering.

Eutectic Welding Alloys Corp. has named **Howard E. Doyle** as field supervisor with headquarters in Minneapolis. Doyle will cover Minnesota, North and South Dakota, and Northern Wisconsin.

Daniel B. Lamb has been appointed Detroit division manager for Oakite Products, Inc., New York City. He replaces **Thomas R. Smith,** who is retiring.

continued on page 18

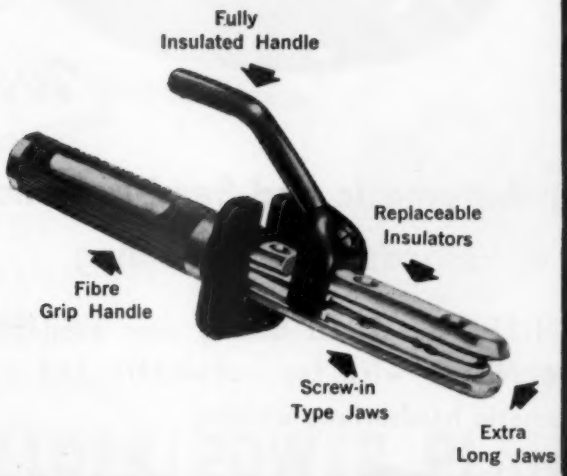
For More Information Circle No. 28 on Reader Service Card.

For 27 Years Preferred By Welders

THE DURO "STANDARD"

- All Parts quickly replaced with a screwdriver
- Screw-in type jaws — No tools required
- Insulated Handle and Guard — Protects operator
- Rugged Fibre Handle — Lasts longer
- Cool Operation — Cool Handling

Featuring "Long Jaw design" for reaching those "hard to get at places".



DURO ENGINEERING COMPANY
31 OREGON AVE. · HAMDEN, CONN.

SMS CORPORATION

Headquarters for Resistance Welding Supplies

R.W.M.A. Classes of alloys in castings, forgings and bar stock; copper tungsten alloys

Standard electrodes; special electrodes and fixtures designed and built

All types of straight and offset holders

Welder wheels in all alloys and sizes

Tip dressers, reamers and contour dressers

Adjust-A-Pressure holders (above, left) used with Adjust-A-Angle adapters solve many welding problems; change from one electrode spacing to another — a matter of minutes — with the same set-up.

S-M-S CORPORATION

2254 COLE AVENUE · BIRMINGHAM, MICHIGAN

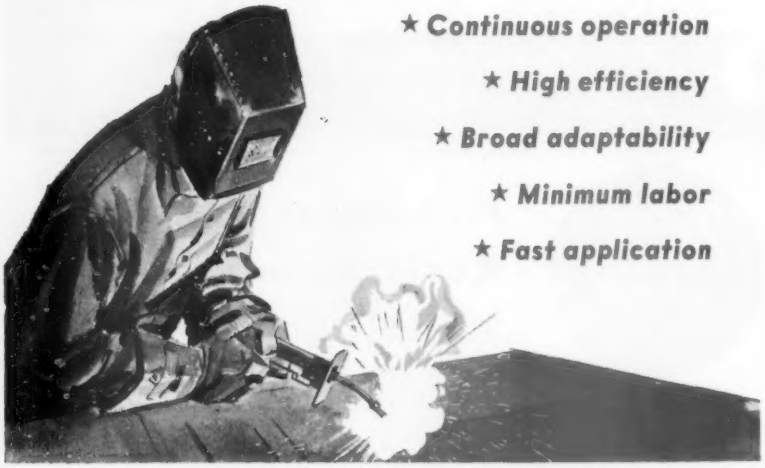
For More Information Circle No. 66 on Reader Service Card.

NOW IT'S READY!

New **Ranomatic** *Wire*

For Automatic and Semi-Automatic Hardsurface Welding

RANITE manual rod quality now available in tubular coil wire for automatic and semi-automatic hardsurface welding



★ *Continuous operation*

★ *High efficiency*

★ *Broad adaptability*

★ *Minimum labor*

★ *Fast application*

RANOMATIC will be sold through your local **RANITE** distributor. For detailed information and prices ask him for bulletin No. R101, or write direct to Rankin Manufacturing Company.

RANKIN MANUFACTURING COMPANY

616 S. MARENGO AVE. P. O. BOX 631 ALHAMBRA, CALIF.

For More Information Circle No. 63 on Reader Service Card.

MEN ON THE MOVE

continued from page 16

PROMOTIONS:

Dr. Robert I. Jaffee and **George K. Manning** have been named technical managers in the Department of Metallurgy, Battelle Memorial Institute, Columbus, Ohio. They will direct research activities in several metallurgical fields.

ELECTIONS:

The Crescent Co., Inc. and its Carol Cable Division, Pawtucket, R. I., have announced the election of **Kenneth R. MacLean** as vice-president-sales and **Louis F. Palana** as vice-president-operations.

Herbert W. Clough, vice-president-marketing, of the Belden Mfg. Co., Chicago, has been elected to the Board of Directors. He started with the company in 1922.

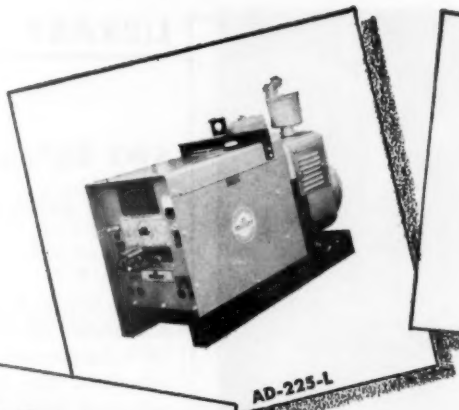
The International Institute of Welding has elected **Fred L. Plummer** international vice-president. He assumed office at the Institute's annual assembly in Liege, Belgium. Mr. Plummer is National Secretary of the American Welding Society.

J. M. Roehm, vice president—research and development, Kawneer Co., Niles, Michigan, was elected president of the National Association of Architectural Metal Manufacturers for 1960-1961.

DEATHS:

William H. Roberts, executive vice-president of Detroit Stamping Co., died June 21 of cancer at the age of 42. Mr. Roberts worked during his entire adult life for the company which his father founded.

C. J. Hogan, district sales manager for Miller Electric Manufacturing Co., Inc., Appleton, Wis., passed away at his home in West Covina, Calif. He was 33 years old.



AD-225-L

D-250-WE

AEA-200-LE

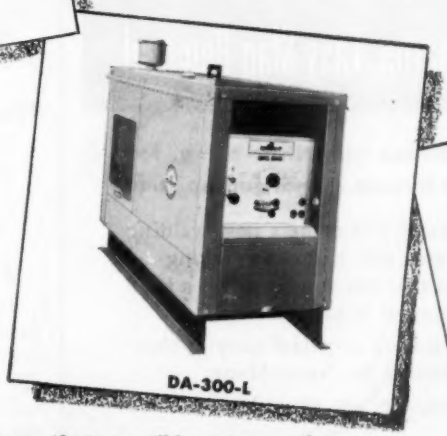
D-250-L

FIRST and FINEST FAMILY of WELDER/POWER PLANTS

Miller originated the combination welder/power plant. This established a lead never lost notwithstanding the most widespread efforts at copying and duplication. Shown here are gas and diesel engine driven welders in d-c and a-c/d-c models.

In this group there is a welder/power plant size, type and price to meet every practical need – all available with field-tested accessories and trailers.

DD-250



DA-300-L

DAH-350-L

Complete specifications will be sent promptly upon request. Please indicate model or models.

miller ELECTRIC MANUFACTURING COMPANY, INC. • APPLETON, WISCONSIN

EXPORT OFFICE: 250 West 57th St., New York 19, N. Y. • Distributed in Canada by Canadian Liquid Air Co., Ltd., Montreal

For More Information Circle No. 57 on Reader Service Card.

NOW, A MANGANESE STEEL ELECTRODE
with High Build-up, Low-spatter, Easy Slag Removal

A special new Amsco rod, Nicro-Mang, for both joining and buildup of manganese steel

Out of Amsco® metallurgical research has come a new welding rod that gives you high weld strength without cracking on Austenitic manganese steel. A rod that lets you lay down a bead without slag popping, and slag removal is easy.

To lick the cracking problem, it took a special alloy of chromium and nickel, plus a unique coating for Nicro-Mang.

Write for Nicro-Mang bulletin, or see your local Amsco distributor.

Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

AMERICAN Brake Shoe COMPANY

AMSCO

American Manganese Steel Division • Chicago Heights, Illinois

For More information Circle No. 7 on Reader Service Card.

LIBRARY

of welding

AWS Bibliographies

"1959 Supplement to American Welding Society Bibliographies" by the American Welding Society, Department T., 33 West 39th St., New York 18, New York, $1.50.

The American Welding Society has announced the availability of the 1959 *Supplement to the AWS Bibliographies.* The original publication contained bibliographies of articles which appeared in the *Welding Journal* from 1937 to 1957. Each year a supplement is compiled listing the previous year's articles. The current supplement contains listings of all articles appearing in the *Welding Journal* from January through December, 1959.

Welding In Ship Salvage

"Marine Salvage Operation" by Edward M. Brady, surveyor, U. S. Salvage Association, Inc., June 1960, 256 pages. Order from Cornell Maritime Press, Cambridge, Mass., $8.50.

This handbook for salvage men and divers covers the welding techniques, equipment, and problems used in general ship salvage.

Naval architecture, including marine welding design, is discussed and illustrated. Strength charts are included.

Underwater cutting and welding is also covered.

Special coverage is given to gear, diving boats, and safety precautions.

Titanium Welding

"The Welding of Titanium and Titanium Alloys" by C. E. Faulkner and C. B. Voldrich, Defense Metals Information Center, Battelle Memorial Institute, Dec. 1959, 69 pages. Order PB 151079 from OTS, U. S. Dept. of Commerce, Washington, D. C. $1.75.

This revised report discusses advances in titanium welding. Included is the use of inert gas-shielded metal-arc welding in the production of titanium assemblies. Also described is the welding of Ti-SA1-2.5Sn and Ti-6A1-4V alloys.

The study also covers general welding procedures, surface cleaning, quality control, stress relief treatment, and the mechanical properties of welded joints in titanium mill products.

Best news in years about Resinoid Wheels!

Norton Reinforced Resinoid Wheels — rigid and semi-flexible — have long been an unbeatable team for handling an almost endless list of weld grinding jobs.

Today, these weld grinding favorites are produced in the new Norton Worcester Plant No. 8 — five acres of the very latest facilities for grinding wheel manufacture — where quality control, always a key factor at Norton, is now as thorough as ultra-modern equipment and development can make it.

- *Norton BD and BDA rigid wheels, raised hub type, glass-nylon reinforced, are ideal for grinding medium to heavy welds, including stainless steel — and for smoothing flame-cut edges, notching, slotting and cutting-off.*
- *Norton BFR semi-flexible wheels, raised hub type, nylon reinforced, are fast and free cutting in lighter weld grinding, removing scale, blending contours, scarfing and beveling before welding.*

For further facts on the latest, most outstanding progress in weld grinding wheels — both the reinforced types and straight, cups and cones — see your Norton Distributor. Or write to NORTON COMPANY, General Offices, Worcester 6, Massachusetts. Plants and distributors around the world.

NORTON
ABRASIVES

W-1971

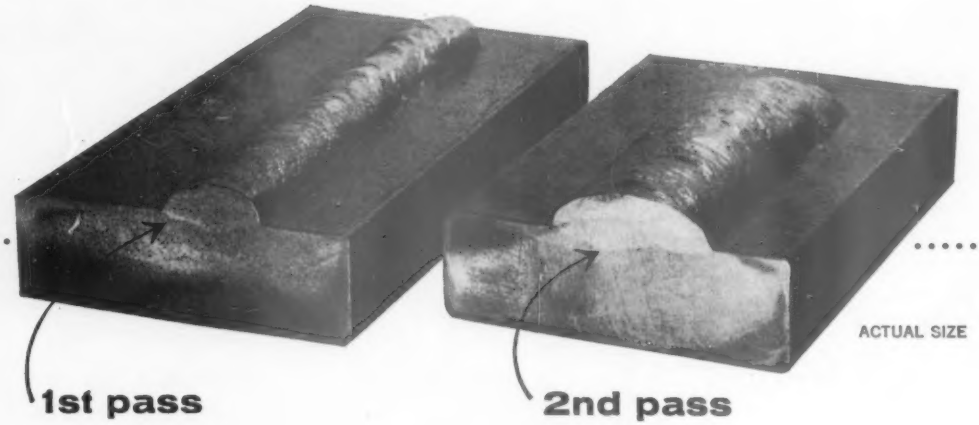
75 years of . . . Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

For More Information Circle No. 60 on Reader Service Card.

STOODY BUILD-UP

(Iron Powder Coating)



Compare the new Stoody Build-Up with any other material of this type. It gives you:

SPEED.....15% to 50% faster deposit rate

BUILD-UP.....Higher—with sound deposits

ECONOMY.....High welding efficiency gives lower cost per pound of deposit

WELDABILITY.....Stable arc—low spatter—less smoke

OTHER FEATURES....Higher tensile strength—low crack sensitivity—excellent machinability

Use Stoody Build-Up for

- Shafts (to be machined)
- Gear Teeth
- Sprockets
- Tractor Rails
- Churn Drills
- Build-up on carbon steels for hard-facing overlay

See your Stoody dealer for complete information (check the Yellow Pages of your phone book) or write to

STOODY COMPANY

11982 E. Slauson Ave. • Whittier, California

For More Information Circle No. 71 on Reader Service Card.

AUGUST, 1960
Welding Design & Fabrication
ESTABLISHED IN 1930 AS INDUSTRY & WELDING

SPECIAL REPORT

WELDED HIGHWAY BRIDGES . . .
Are The Figures As Good As They Look?

FORTY-THREE STATES build welded highway bridges. Five years ago only 17 States did.

This is one of the most important facts to come out of a survey conducted by Western Union for WELDING DESIGN & FABRICATION. The survey covered highway bridge engineers in the 50 States. It asked them for the present facts about welded bridges and it asked them for their views of the future.

We analyzed the results with the help of our Editorial Advisory Board (see April, 1960, pages 96-97). Conclusion: The picture is rosy, but there is room for improvement.

THE ROSY SIDE

That 43 States now build welded bridges shows that welding has made great progress in the last five years. "A quite impressive figure," says Arsham Amirikian, a consulting engineer of Chevy Chase, Maryland. "I feel it means real progress toward the general acceptance of welding."

The reasons for this increase are summed by J. B. Austin, manager-welding division, Republic Structural Iron Works, Cleveland, Ohio, and Robert J. Kriz, Herron Testing Laboratories, Cleveland. According to Mr. Austin, the successful use of welded bridges in projects such as the New York Thruway has done much to increase their use by other States. According to Mr. Kriz, welding has two big advantages that make it a natural for bridges. These are speed and resulting low costs—made possible by improved welding techniques and procedures—and appearance—welded bridges are sleek and graceful.

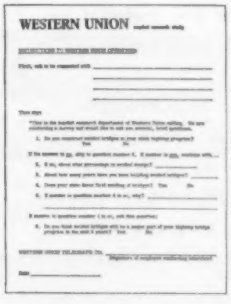
THE BIG BUT

First of all, seven of our 50 States still do not weld bridges. These are Alabama, Colorado, Mississippi, New Mexico, North Carolina, North Dakota, and West Virginia. And, these States told us that welded bridges would not be an important part of their highway bridge programs during the next five years.

Secondly, 43 states do build welded bridges. But, only 32 percent of all the bridges they build are welded. Many of the states (South Dakota, 100 percent; New York and Utah, 90 percent; New Hampshire, 80 percent; and Oregon and Kentucky, 75 per-

continued on the next page

this questionnaire went to 50 states


WESTERN UNION

and brought this information . . . . .

cent) seem to be completely sold on welding, but there are still 10 States that weld five percent or less of their bridges. And many say they weld only small or relatively small amounts of their bridges. One tempering point is made by R. E. Robison, chief designer for Howard, Needles, Tammen & Bergendoff, consulting engineers. Mr. Robison says the State Highway Departments require a variety of different bridges. Welded bridges are often not appropriate at many locations, but they are usually used where they suit.

On the other hand, Louis J. Larson, consulting engineer, Milwaukee, said he had thought the building of welded bridges was lagging all along. But, he said he was surprised that welding was used so little.

LACK OF CONFIDENCE IN WELDING

Call it lack of confidence, call it fear, or call it ignorance, it's a big factor. Loren Miller, works manager—steel fabricating division, Austin Company, Cleveland, points out that fear of poor quality often excluded welding. The same fear led to specifications and inspection requirements that call for welding quality beyond actual needs. Mr. Miller says many fabricators and erectors complain that the commonly used steels (ASTM-A7 and ASTM-373) do not meet the rigid specifications placed on butt welds used to join those materials. The allowable flaws (minor secondary laminations) allowed in these steels are much greater than the maximum imperfections of similar type allowed in the weld metal.

Mr. Kriz points out that ignorance breeds the fears that hold back welding. He feels that no one with knowledge of welding could use lack of quality controls or difficulty and expense of inspection as valid reasons for rejecting welding on bridges.

Another deterrent to welded bridges is pointed out by Roy B. McCauley, chairman of the Department of Welding Engineering, at Ohio State University, Columbus. He explains that most State highway departments are small and understaffed. They do not have the time nor the money for research and development. This means the contractor must bear the burden and cost of proving any alternate fabricating processes and materials he might wish to use. But, even if the contractor proves his point, the State does not have to adopt his method.

WELDED BRIDGES HAVE THREE BIG COMPETITORS

They are rivets, high-strength bolts, and prestressed concrete.

Rivets seems to be on their way out in structural fabricating. In fact, it is getting more and more difficult to gather the four experienced men needed to make up a satisfactory riveting crew.

High-strength bolting with its two-man crew is speedier and is a stiff competitor. However, inspection costs are high, because two men with impact and torque wrenches are needed. But, bolt manufacturers, trade associations, and the like have done a

continued on page 26

Here's what the competition is doing to combat welding . . .

More than 100 designers, architects, engineers, professors, editors, purchasing agents, and others who influence how bridges and buildings are put together met recently at the Engineering and Service Center in Cleveland, Ohio. They heard about "New Developments in Structural Bolting" presented jointly by United States Steel's Supply Division and Lamson & Sessions Company, a Cleveland, Ohio, fastener manufacturer.

A crisp, snappy, hard-sell professional presentation explained how fastener manufacturers are hammering at cutting the cost of structural connections and at reducing the labor and material needed to build bridges, buildings, drag buckets, and other structures.

The program featured a new high-strength bearing bolt. It's designed so only one man is needed to drive it—not four men as in riveting and not two men as in high-strength bolting.

Besides introducing the bearing bolt, speakers disclosed other developments in bolting. Each one of these is supposed to make structural field connections cheaper and easier.

This presentation is being repeated across the country in 30 cities and six separate audiences in each city. Figure it out. Here's a captive audience of over 20,000 influential people. Add the impact of accompanying industrial press and newspaper publicity and you have perhaps another 20,000 more people who could be sold on the advantages of bolting.

Should this put a bug in our industry's ear? It certainly should!

The welding industry needs the same kind of hard-hitting, hard-selling program. It, too, needs cross-country campaigning for all-welded structures. The country must be told that welding has a big edge over fasteners: There are no holes to punch, no heavy overlapping splices, no unsightly protrusions. Welding offers strength, design simplicity, and low cost.

Welding industry, arise!

These states are building welded bridges

These questions were answered by these states	How many years have you been building welded bridges?	What percentage is welded design?	Does your state favor field welding of bridges?	If not why not?
Alaska	2 years	Very Small	No	Remoteness of work and unfavorable weather
Arizona	4-5 years	Relatively Small	No	Inspection problems
Arkansas	5 years	25%	No	No control of welding
California	3 years	Low percentage	—	
Connecticut	22 years	75%	Yes	
Delaware	6 years	15-20%	Yes	
Florida	15 years	Small	Yes	
Georgia	5 years	——	Yes	
Hawaii	12 years	Less than 5%	No	
Idaho	2 years	5%	Sometimes	If location permits
Illinois	4 years	5-10%	No	
Indiana	1 year	5%	No	Prefer high strength bolts
Iowa	4 years	15%	No	
Kansas	28 years	10-20%	Yes	
Kentucky	5 years	75%	No	Difficult and expensive
Louisiana	5 years	10%	Yes	
Maine	10 years	30%	No	Too difficult to control
Maryland	5-6 years	50%	No	Difficult
Massachusetts	15 years	75% (some welding)	No	Unsatisfactory welds
Michigan	5 years	5%	No	Quality control problem
Minnesota	10 years	5%	No	Poor welds
Missouri	1 year	5%	No	Field inspection problem
Montana	——	Some	Partially	
Nebraska	7 years	25%	No	Cost of inspection
Nevada	3 years	10%	No	Hard to control
New Hampshire	5 years	80%	Yes	
New Jersey	2 years	20%	Yes	
New York	20 years	90%	Yes	
Ohio	20 years	40%	Yes	
Oklahoma	5 years	25%	Yes	
Oregon	6 years	75%	No	Quality problems
Pennsylvania	2 years	Small	Yes	
Rhode Island	3-4 years	Less than 10%	If Necessary	No confidence
South Carolina	20 years	5%	No	
South Dakota	15 years	100%	Yes	
Tennessee	1 year	——	Yes	
Texas	12-15 years	75%	Yes	
Utah	1 year	90%	No	Inspection difficulties
Vermont	1 year	1-2%	No	
Virginia	2 years	5-10%	Yes	
Washington	1 year	2%	Undecided	
Wisconsin	3 years	10%	Sometimes	Only secondary connections
Wyoming	5 years	35%	Yes	

These states are not building welded bridges

Alabama
Colorado
Mississippi
New Mexico
North Carolina
North Dakota
West Virginia

And, all these states said welded bridges would not be an important part of their highway bridge programs in the next five years.

WELDED HIGHWAY BRIDGES

continued from page 24

good job of selling bolting competitively against welding.

Prestressed concrete, overlooked by many, is making big strides in the construction of bridges. This point was made by C. D. Jensen, research and testing director, Pennsylvania Department of Highways, Harrisburg. He says 13 prestressed concrete plants have been set up in Pennsylvania in the last 10 years. Mr. Jensen says that well-engineered short span concrete bridges (50 to 100-feet) for overpasses and interchanges have been built speedily and economically.

Loren Miller points to work of the Portland Cement Association. He says it has distributed outstanding literature on the advantages of prestressed concrete construction. This Association, says Mr. Miller, has simplified the sales job of the cement industry in a way that might well be imitated.

FIELD WELDING PROBLEMS

Sixteen States favor field welding of bridges; 22 do not. Most of the reasons against field welding seem to be the difficulty in getting quality welds and the difficulty and expense of inspection in the field.

Those states that build a large percentage of welded bridges and those states that have been welding bridges for a long time are the states which favor field welding. For example, in seven States building over 10 percent of their bridges from welded designs and having more than 10 years experience, only one objects to field welding.

Loren Miller points out that there are enough people using field welding to prove it can be done. Mr. Miller was interested to learn that the States not favoring field welding were not necessarily those Northern states where extremely cold weather could be detrimental.

R. E. Robison explains that welded field splices need the least shop fabrication and provide a bridge that generally looks better than one with bolted or riveted splices. Mr. Robison adds that the difficulty in controlling quality and inspection more than offsets the natural advantages of the welded connection in the minds of many State highway people. He explains that field welding has generally become acceptable for secondary connections and low stress-carrying members, but not for splicing principal stress-carrying members. Here, the high-strength bolts are used more widely.

WHAT MUST THE WELDING INDUSTRY DO?

How can we get seven holdout States to weld bridges? How can we get those 43 states that are welding to weld more?

The answer has been outlined by John Mikulak, assistant to the vice president, Worthington Corp., Plainfield, New Jersey. He says the welding industry needs to do more promoting and educating. In his words, "Before we can expect substantial gains, design techniques and application welding data must be understood by design engineers." He suggests this 7-pronged attack:

Sell the designers. Present the design of welded bridges in a complete, practical design manual. [Recognizing this problem, our editors have been sending WELDING DESIGN & FABRICATION to bridge engineers in each of the 50 States. Many have written to thank us for the articles we have carried on the design and fabrication of welded bridges.] And, don't overlook the county and city bridge engineers. This is another field for the seeds of designing welded bridges.

Educate if you want to sell welded bridges. There is need for comprehensive text books. Presently, most text books give welding a cursory treatment. Even worse, they improvise from conventional design to welding by merely changing a joint or scaling down plate thickness from other fabrications. This is not good welding design.

Exploit the concept of plastic design. It is not widely known, but it leads to maximum economy and functional structures.

Stress in a commercial campaign, the technical and economical value of welded design. Also promote training methods for teaching actual welding and to show how environment and circumstances affect welding. The lagging States must be shown how to properly apply welding. Cite States that successfully converted to welding.

Some say the American Welding Society cannot promote the commercial aspects of welding and remain a pure technical society. Why not, ask many people? Other organizations do. For example, the Steel Founders Society exploits poorly designed weldments in their "case histories series."

Another way would be to increase the activity of the National Welding Supply Association. It could act as a technical commercial outlet. Other associations which could help are the National Electrical Manufacturers Association and the American Institute of Electrical Engineers.

Teach the general public and their representatives the virtues of welding. Fears or doubts caused by lack of familiarity must be removed.

Inspection methods can be improved, but the real problem is still confidence. Does an inspector know at a glance that a riveted joint is stronger than a welded one? The real difference is in confidence, instilled by many years of experience. Perhaps with more education this learning process can be speeded.

And finally, let's not forget welded design and welding. C. D. Jensen feels that if welded bridges are to compete head-to-head with, say, short span prestressed concrete bridges, the prices will have to come down, perhaps through better design of girders, better design of the floor system and seat details, and certainly by more automatic welding. • •

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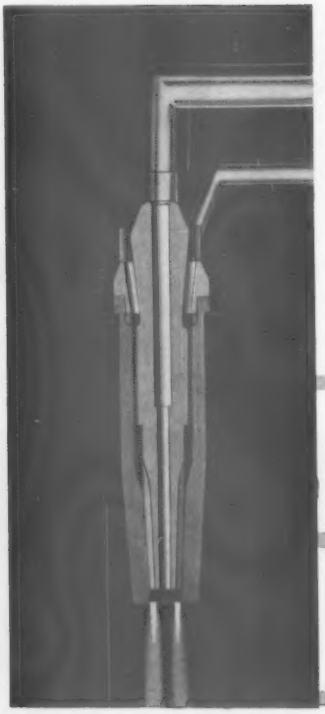

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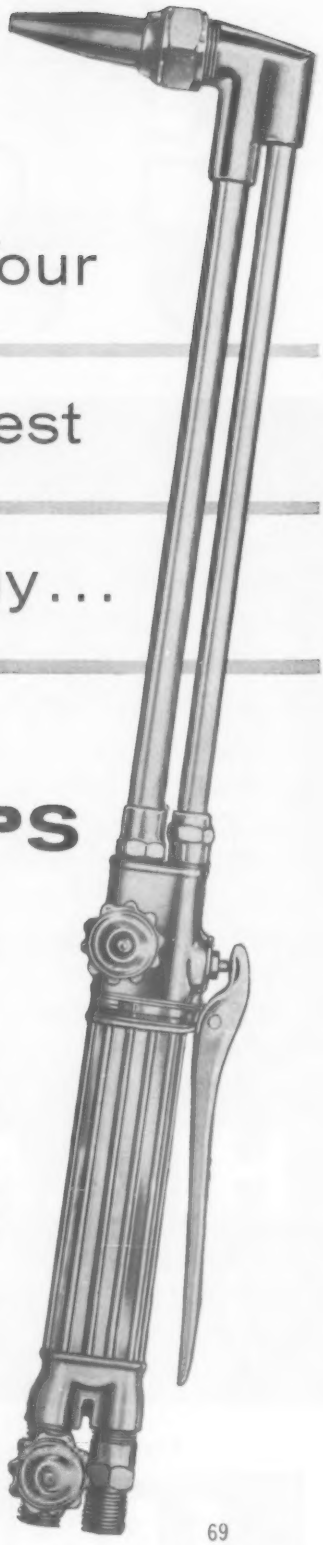

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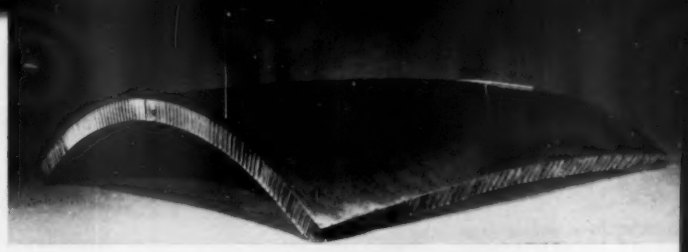
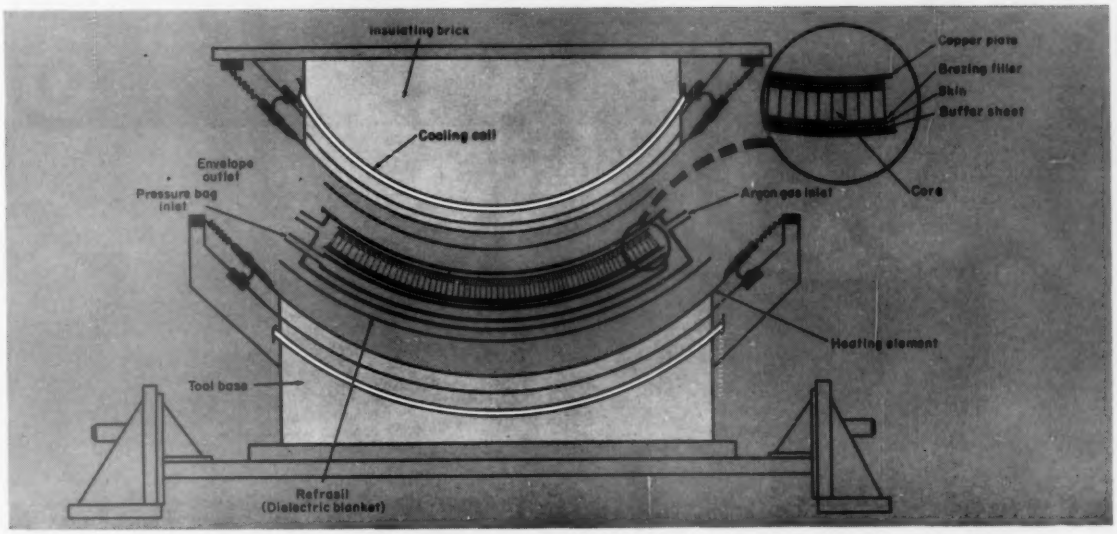


by MEL SCHWARTZ and B. G. BANDELIN,
The Martin Company, Baltimore



Blanket Braze Dished Honeycomb Panels

IN BRIEF: The limitations and high cost of furnace brazing led Martin to develop electric blanket brazing. Here's how it works on dished panels.

The common way to braze stainless steel sandwich structures is to heat them in a large furnace. But furnace brazing is expensive and limited. To replace it, our company developed electric blanket brazing.

At first we blanket-brazed 2- by 6-foot flat panels. Then we brazed single contour panels. Finally, and this was our goal, we designed a fixture for brazing compound contour honeycomb panel. The fixture had heating elements, a cooling system, and accessory tooling. It had an upper and lower blanket (platen) of cast-refractory on an aluminum frame. Water pipes, cast in the refractory, cool the fixture quickly after the assembly is brazed.

Heating elements of 1- by 0.010-inch Nichrome V run along the face of the refractory. The elements produce 14 watts a square inch at 5 to 35 volts. We regulate the voltage and heat at the control panel. Our power source is 440 volt, a.c., 3-phase.

Thermocouples embedded in the fixture and work tell us the brazing heat (within 25 F) and the heat treating heat (within 10 F).

We make a sandwich of clean stainless steel skins, core, and brazing alloy. The brazing alloy is 92 silver, 7 copper, 0.3 lithium. We tack braze it to each steel skin. Then we put the assembly in a 301 stainless steel envelope coated inside with a parting agent. We insert steel tubes at each corner of the envelope and weld it shut. Through these tubes we remove the air and replace it with argon under pressure. The argon prevents oxidation of the panel.

We apply pressure between the platen and the sandwich with a stainless steel bag inside the envelope. We use argon inside this cushion. Also, we distribute heat evenly across the panel by inserting a 0.062 inch copper sheet between the buffer sheet and the pressure bag. The copper absorbs heat.

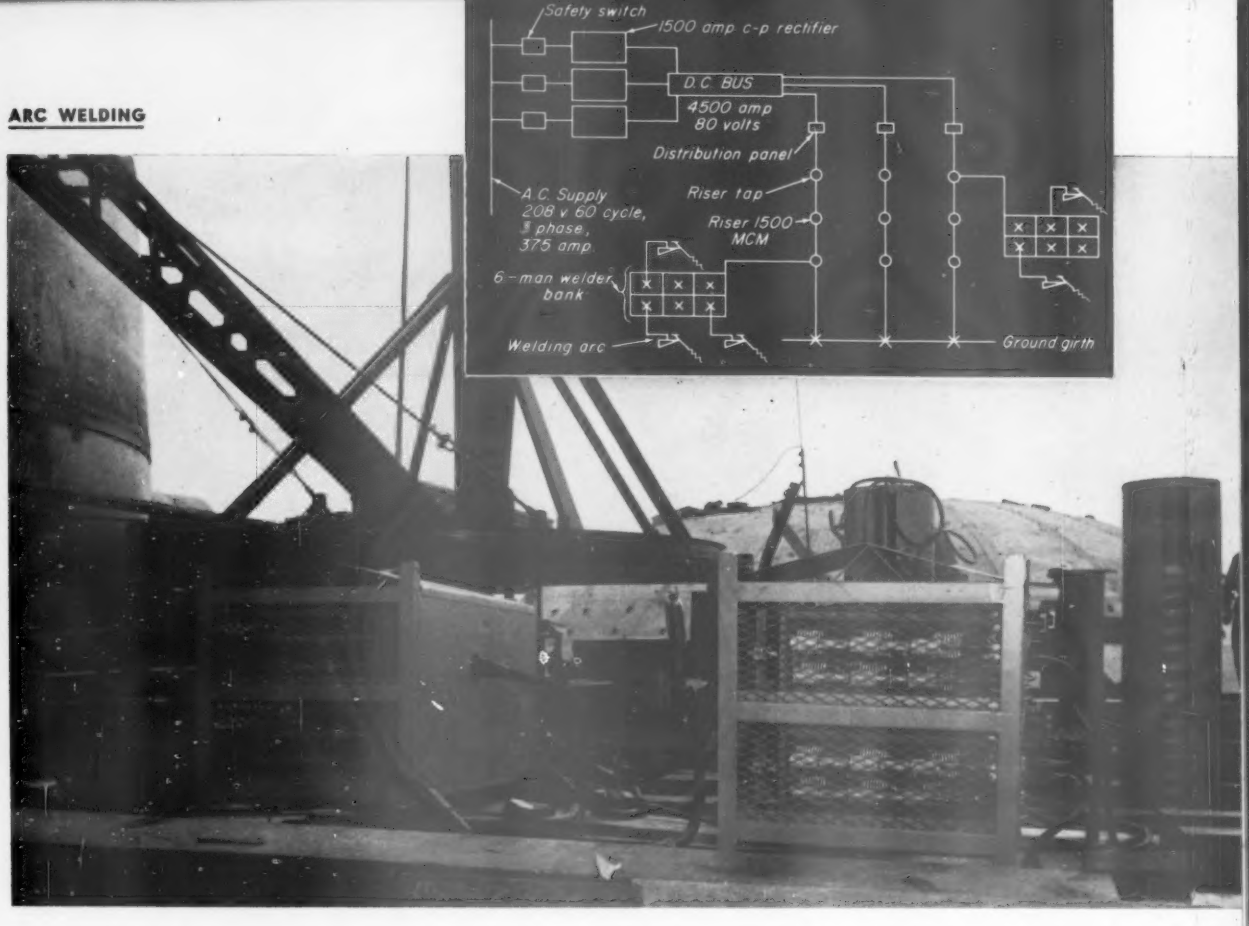
HONEYCOMB CORE SHAPES TO PLATEN

Most of the components, the copper sheet, pressure bag, buffer sheet, and envelope, are shaped before assembly. However, the flat honeycomb core assumes the shape of the platen during brazing. We insulate the envelope from the heating elements with a layer of Refrasil to prevent shorts.

When the panel is in the fixture, we heat the platen to 1,725 F. and hold heat for 5 to 10 minutes. Then we flood the coils with water to cool the panel. We remove the envelope from the fixture, seal the purging tubes, then hold the panel at 100 F up to 8 hours; the panel mass gives us the length of time.

After the assembly cools, the purging tubes are hooked up, and the assembly is put back in the blanket fixture. Argon is fed in the envelope, and the platen heated to 950 F for 1 hour. Then we cool the job to 100 F, air cool it to room temperature.

One of the big advantages of the electric blanket is short brazing time. This avoids the old brazing bugaboo: alloy flow on the open end of the panel.



Need 400 Welding Arcs? Use Only

IN BRIEF: Consolidated Edison needed many arcs to complete a big expansion program and maintain it afterward. They chose multiple-operator equipment; it was cheaper to install, operate, and maintain.

MANY WELDING ARCS from one power source . . . is the key to excellent and economical welding in the construction and maintenance of two electrical power plants that supply New York City. The plants are part of Consolidated Edison's expansion program to add 635,000 kw to the city's electrical supply in the next two years. One is the Astoria Plant, the other, the Indian Point Plant, the first privately-owned atomic power generating station in the U. S. Both have Multi-Arc installations, which cost less than 1-operator machines.

The installations are built up from 1,500-amp units each consisting of 36 diodes with parallel outputs. The installations provide constant-potential, reverse-polarity d.c. for 320 manual arcs. They also furnish 80 straight-polarity arcs. The open circuit voltage produced is almost constant: at idling load it's 80 volts, at full-rated load, 78 volts.

At the Astoria plant, the 6-unit, 9,000-amp power pack will furnish 240 arcs. The 208 volt, 60-cycle, 3-phase a.c. input feeds through 600-amp safety switches to the rectifiers. The d.c. supply bus (output) connects to the building's five 1,500 MCM risers, which have taps at several elevations. Individual arcs are quickly connected through resistor banks to the nearest riser tap. Each bank contains six drawers; each drawer provides welding current for one operator. Forty banks, 240 arcs. At peak load, the use-factor for the 6-man units is about 90 percent.

The Indian Point installation is similar, but smaller. It has four 1,500-amp rectifiers and thirty 6-man resistor banks. At both plants, a 1,500 MCM ground girth is welded to the building framework to assure good welding grounds.

Operators working at the two plants agree that they get good welds because the Multi-Arc units put out constant voltage. According to J. B. Nottingham & Company, co-engineers of the installations with Con Edison, the unit's resistive circuits are responsible for the good welds. It produces a straight-line volt-amp curve; the dynamic and static curves agree closely. Result: Smooth arc, little weld spatter.

SCHEMATIC DIAGRAM (insert) shows the Indian Point multiple-operator installation. Six-man banks (photo) quickly connect to the nearest riser tap, which are located at several elevations.

WELDING CURRENT for joining a bracket to a structural member comes from the 6-drawer resistor bank on the right. The arc is smooth, throws little spatter because the voltage is almost constant.

by **HENRY LEFER**, *eastern editor*

10 Power Sources

To set current, an operator simply combines switches on a drawer front. He can get up to 315 amps in 5-amp steps this way. And, because he does not have to go to the power source he saves time.

A 6-drawer bank weighs about 450 lb., one drawer weighs 45 lb., one unit takes about the same space as a 1-operator machine. When space is limited, the resistor units can be stacked 2-high. Drawers are interchangeable, easily moved to the nearest tap.

A 1,500-amp unit is 40 inches square, 65 inches high, and weighs 1,900 lb. A small crane lifts it, a lift truck can move it. It doesn't take much more room than a conventional welding machine.

Rugged construction and heavy-duty components make the constant-potential Multi-Arc equipment long-lasting and maintenance-free. The resistor stations have no moving parts, hence nothing to replace. They are cooled by convection.

Con Edison engineers expect big savings by inter-changing components between plants. They expect the installation, operation, and maintenance savings to liquidate much of their investment. They expect also to save space. The company is convinced their investment is a good one.

33,000 UNUSED AMPS

You might ask: "How can a 9,000-amp power supply provide current to 240 operators welding, say, at 175 amps when simple arithmetic says they need 42,000 amps?"

Two reasons make it possible:

1. Low duty cycle—about 25 percent for coated electrode welding. Duty Cycle, by the way, is the ratio of actual arc time to the total time the equipment is on.

2. All operators don't weld at once. Records on a typical construction job show that only 50 to 75 percent of the operators weld at the same time. This is called the "diversity factor."

Figure it this way: Each operator working off a five-power pack installation will have:

$$\frac{7{,}500 \text{ amp}}{210 \text{ arcs}} = 36 \text{ amps continuous}$$

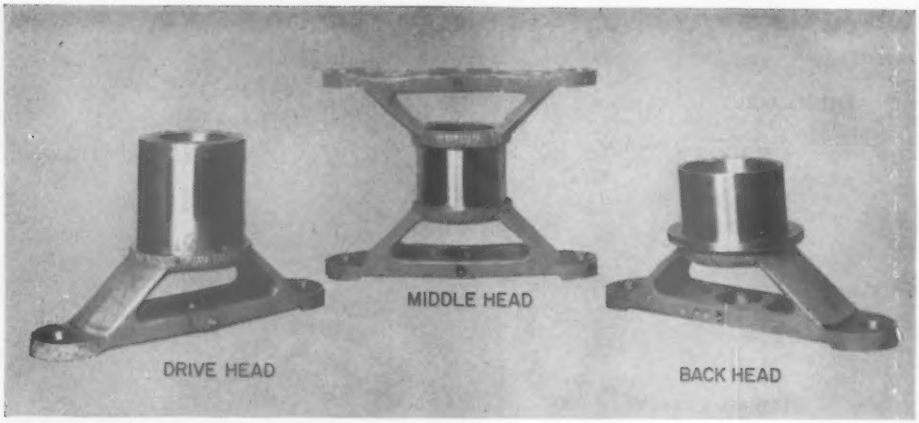
$$\frac{36 \text{ amps}}{.25 \text{ duty cycle}} = 144 \text{ amps}$$

At 75 percent diversity factor:

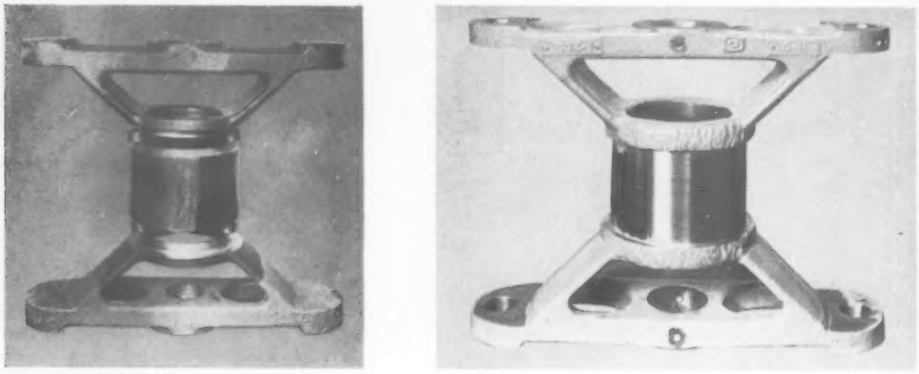
$$144 \text{ amps} \times 1.5 = 216 \text{ amps}$$

These figures are conservative; they are good estimates from data obtained from one, 1,500-amp power unit supplying 30 to 40 arcs. As power units are added (up to five) and paralleled in the pack, the diversity factor advantage increases.

What would happen if the equipment were momentarily overloaded? Nothing, says Nottingham. The power source will take 150 percent overload for two minutes before the overload device takes it off the line. And it takes up to a minute and a half to burn down an electrode. This burnoff will correct the overload. If all operators should strike their arcs at once, the overload trip would take the unit off the line without damage.



CAST-WELD flyer heads support supply strand bobbin and also revolve supply strand around the bobbin at 600 rpm.



PRE-MACHINED steel castings and steel tubing are assembled for welding (left). Finished part is shown at right.

6 Advantages Of Cast-Weld Design

IN BRIEF: A switch to cast-weld design means less machining, fewer rejects, smaller inventory, and a lighter part.

A SWITCH to cast-weld construction solved a perplexing problem for Haskell-Dawes Machine Co., Inc., Philadelphia. It had been casting iron flyer heads for its rope-making machines. There were three different heads, all cast according to ASTM Specification A27-52T, Grade 70-36: The drive head (70 lb.), the middle head (80 lb.) and the back head (50 lb.).

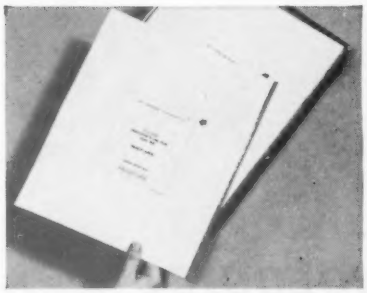
Problem: The cast iron head demanded three different patterns, each with intricate cores. An extensive inventory was needed, too. Rejections ran as high as 60 percent, because machining the bearing surface usually revealed inclusions or blow holes. Finally, it was difficult to dynamically balance the heads because of their shape and large size.

Solution: The company changed to a cast-weld construction of steel castings and seamless steel tubing. An all-welded structure was considered but was discarded as uneconomical because of the intricate design.

The company now buys a single steel casting and machines a flange on it to accommodate a piece of steel tubing. Whenever one of the three flyer heads is needed, the company simply welds the proper size and length of steel tube to the steel casting.

Results: Haskell-Dawes reports these six advantages of cast-weld construction.

- Less machining.
- Rejects almost completely eliminated.
- Steels higher tensile strength enables rope-making machine to work 20 percent faster.
- Parts inventory cut. Any head can be fabricated speedily from stock, insuring faster service.
- Cast-weld construction has cut costs of dynamic balancing of finished parts.
- Weights of parts has been reduced about 10 percent. • •



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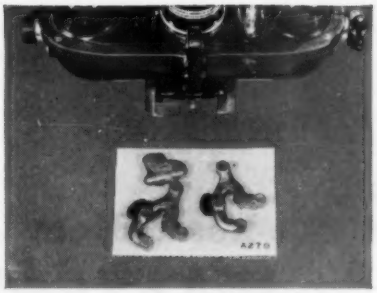

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(specialists in arc welding)

AKANSAS implement manufacturer increased his plant production over 30 percent when the Field Engineer from LINCOLN added a Twinarc attachment to his automatic welding installation. With the savings of the first couple of weeks, he bought another Twinarc and further cut costs.

Here's proof that some production problems can be solved without expensive capital equipment purchases. In this case, just a simple attachment did the job—and it was a standard item in the LINCOLN line.

But it takes a working knowledge of the overall production problem to engineer welding applications efficiently. And that's where the LINCOLN Field Engineer comes in. Sure he sells welding—but more than that, he brings manufacturing know-how into your plant and solves his assigned problem without creating a dozen new ones. He's not only an engineer, he's a weldor. He rolls up his sleeves and demonstrates his recommendations. And, as he engineers the application, he relates it carefully to the overall production operation.

That's why we say it's a good idea to do business with LINCOLN where arc welding is a specialty and cost reduction comes to you as a "plus" at no charge.

THE LINCOLN ELECTRIC COMPANY
Dept. 1360 • Cleveland 17, Ohio

LINCOLN WELDERS

For More Information Circle No. 50 on Reader Service Card.

SPECIAL REPORT

The Impact Of Cyrogenics On The Welding Industry

THE WELDING INDUSTRY uses low temperature processing to turn welding, cutting, and shielding gases into liquids. This makes it easier to manufacture, store, and handle them. The processing—commonly called *cyrogenics*—is done at very low temperatures, ranging from —100°F, the lowest temperature occuring naturally on the earth's surface, to —460°F, or absolute zero.

WHY ARE GASES LIQUEFIED?

The increasing use of large quantities of gases in many industries, including machine flame cutting and gas-shielded arc welding, has created demands for additional supplies that can be provided more economically by shipping and storing gases as liquids instead of compressed gas.

When liquefied, oxygen occupies only a fraction of the space it took as a gas. Compressed as a gas in trailer tubes, 175 cubic feet of gas are forced into the space formerly occupied by one cubic foot. When oxygen is liquefied, 860 cubic feet can be carried in the space required for one cubic foot of gas at atmospheric pressure. This makes it possible to store large quantities of oxygen at the point of use or to deliver large volumes in a single load. The largest trailer for compressed oxygen carries 45,000 cubic feet of gas. A trailer of practical size for liquid oxygen will carry the equivalent of 390,000 cubic feet of gas.

Other gases have their own compressibilities.

WHAT GASES ARE LIQUEFIED?

For the welding industry, processors liquefy the widely used atmospheric gases. They are oxygen, argon, helium, nitrogen and hydrogen.

Great cold is needed to condense these gases. At atmospheric pressure oxygen must be cooled to —297°F, argon must be cooled to —303°F, nitrogen to —320°F, hydrogen to —423°F, helium to —452°F.

WHO USES LIQUEFIED GASES?

The welding industry uses liquefied gases because they are easier and cheaper to store and handle. A large storage tank replaces a bank of cylinders (or a small tank replaces a number of cylinders). The result? Lower operating and overhead costs and increased convenience.

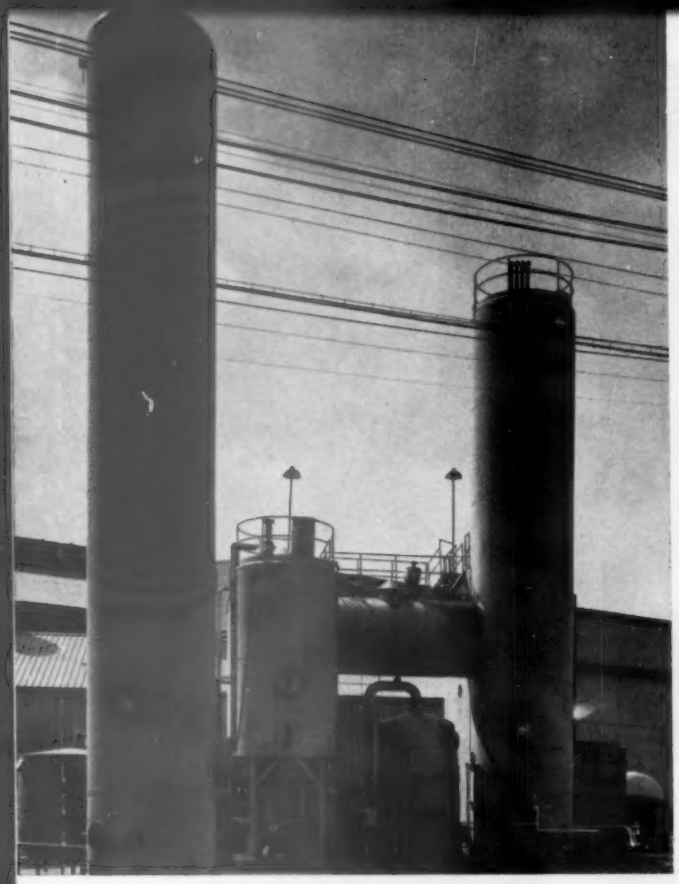
In Cleveland, Ohio, one company's cutting department had to change cylinders six times a day. Now, a 30-gallon portable cryogenic tank lasts two full days. Changing time is trimmed, less floor space is needed, and cost per cubic foot of gas is down.

Larger central storage tanks have similar advantages. For example, a 337-gallon container stores the equivalent of 35,000 standard cubic feet of gas. It is only 48 inches wide, 61 inches long, and 10 feet high,

A BIG FUTURE FOR LIQUEFIED GASES . . .

A big boom is beginning for liquefied gases according to leaders of the cryogenics industry. These leaders feel the industry capacity for liquefied gases in 1965 will be twice what it is today. This estimate does not include the increasing military demands for liquefied gases for missile activities.

Industry leaders also feel that by 1965 the cyrogenics industry will be producing 55 billion cubic feet of liquefied gases, twice as much as now. This figure represents 10,000 user stations, 1,250 transport vehicles, and 1,000 central storage vessels. Half of these must be built in the next five years.



48-MILLION-CUBIC-FOOT oxygen on-site plant.

but it replaces 140 ordinary gas cylinders.

One company that uses large central storage tanks is Ryan Aeronautical Co., San Diego. The company recently installed a giant oxygen and a giant argon tank, each holding 90,000 cubic feet of liquid gas.

Ryan recharges the liquid oxygen system in a half hour. That's one-third the time it used to take to fill the giant tubes they used to use. The liquid system needs only about 200 feet of floor space—less than one-quarter the space needed by the old cascade system.

The liquid argon system holds 90,000 cubic feet of 99.995 percent pure gas. It occupies less than 200 square feet—half of the space needed before.

The metals industries use liquefied gases for a variety of jobs.

- High purity oxygen from liquid gases is used in steel mills to speed oxidation and remove impurities in open hearths, electric furnaces, and oxygen converters. Oxygen also increases the oxygen content of air in open hearth end-burners and in the air blast in blast furnaces. These applications account for 50 percent of all the liquid oxygen used by industry today.
- Nitrogen is used in annealing strip steels that are to be tin-plated. The gas removes oxides and ensures a good bond.
- Hydrogen is used for annealing metals, for preparing sintered metals and metal alloys. Most of this hydrogen used to be produced by electrolysis of water.

Weight and Volume Equivalents of Liquids and Gases

Charts are calibrated diagonally left to right to yield unit values (except gas volume in cubic feet).

AIR

Weight of Liquid or Gas		Volume of Liquid at Normal Boiling Point				Volume of Gas at 70°F	
Pounds	Kilograms	Cubic Feet	Liters	Quarts	Gallons	Cubic Feet	Cubic Meters
1.000	0.454	0.0183	0.518	0.548	0.137	13.35	0.379
2.205	1.000	0.0404	1.144	1.209	0.302	29.44	0.834
54.57	24.77	1.000	28.32	29.92	7.481	728.5	20.63
1.927	0.875	0.0353	1.000	1.056	0.264	25.73	0.729
1.824	0.828	0.0334	0.946	1.000	0.250	24.35	0.690
7.294	3.311	0.134	3.786	4.000	1.000	97.37	2.758
7.493	3.402	0.137	3.880	4.099	1.025	100.0	2.832
2.646	1.201	0.0485	1.374	1.449	0.363	35.31	1.000

ARGON

Weight of Liquid or Gas		Volume of Liquid at Normal Boiling Point				Volume of Gas at 70°F	
Pounds	Kilograms	Cubic Feet	Liters	Quarts	Gallons	Cubic Feet	Cubic Meters
1.000	0.454	0.0114	0.323	0.341	0.0853	9.681	0.274
2.205	1.000	0.0252	0.714	0.755	0.189	21.35	0.605
87.4	39.6	1.000	28.32	29.92	7.481	846.1	23.96
3.085	1.399	0.0353	1.000	1.056	0.264	29.86	0.846
2.919	1.324	0.0334	0.946	1.000	0.250	28.26	0.800
11.71	5.310	0.134	3.786	4.000	1.000	113.4	3.212
10.33	4.686	0.118	3.342	3.533	0.883	100.0	2.832
3.648	1.655	0.0417	1.181	1.248	0.312	35.31	1.000

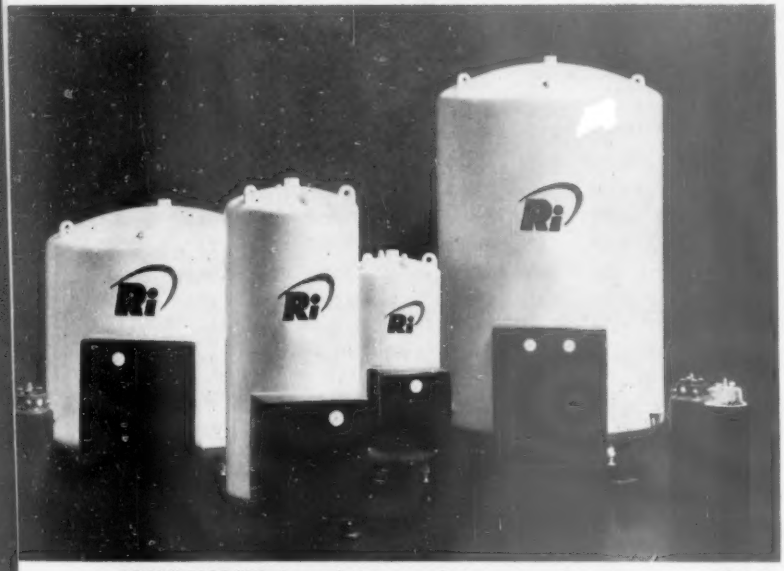
OXYGEN

Weight of Liquid or Gas		Volume of Liquid at Normal Boiling Point				Volume of Gas at 70°F	
Pounds	Kilograms	Cubic Feet	Liters	Quarts	Gallons	Cubic Feet	Cubic Meters
1.000	0.454	0.0140	0.396	0.419	0.105	12.08	0.342
2.205	1.000	0.0308	0.873	0.923	0.231	26.63	0.754
71.5	32.43	1.000	28.32	29.92	7.481	863.5	24.45
2.524	1.145	0.0353	1.000	1.056	0.264	30.48	0.863
2.388	1.083	0.0334	0.946	1.000	0.250	28.84	0.817
9.560	4.336	0.134	3.786	4.000	1.000	115.5	3.271
8.28	3.756	0.116	3.285	3.472	0.868	100.0	2.832
2.92	1.324	0.0408	1.155	1.221	0.305	35.31	1.000

HELIUM

Weight of Liquid or Gas		Volume of Liquid at Normal Boiling Point				Volume of Gas at 70°F	
Pounds	Kilograms	Cubic Feet	Liters	Quarts	Gallons	Cubic Feet	Cubic Meters
1.000	0.454	0.128	3.625	3.832	0.958	97.08	2.749
2.205	1.000	0.283	8.00	8.468	2.117	214.1	6.063
7.80	3.541	1.000	28.32	29.92	7.481	757.3	21.45
0.2753	0.125	0.0353	1.000	1.056	0.264	26.73	0.757
0.2605	0.118	0.0334	0.946	1.000	0.250	25.29	0.716
1.045	0.474	0.134	3.786	4.000	1.000	101.5	2.875
1.033	0.469	0.132	3.738	3.948	0.987	100.0	2.832
0.3637	0.165	0.0466	1.320	1.396	0.349	35.31	1.000

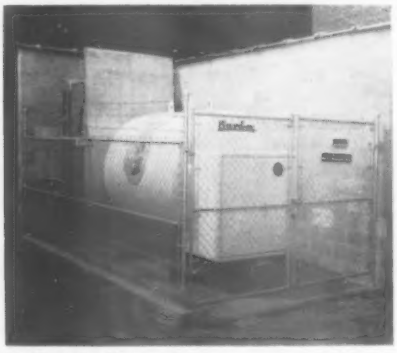
HOW LIQUID GASES ARE STORED



SCALE MODELS show relative size of storage vessels and converters (left to right) of 3,000, 250,000, 69,000, 35,000, 500,000, and two units of 3,000 cubic foot capacity.

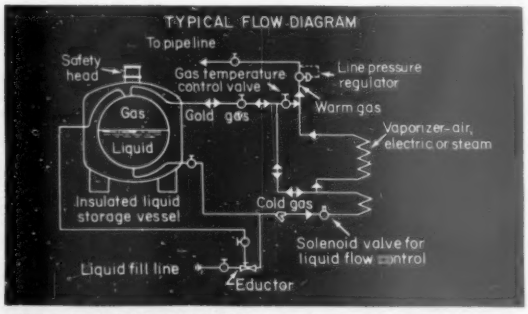
300 GALLON vertical liquid oxygen or nitrogen station delivers either liquid or gas. It is made in both aluminum and stainless.

LIQUID OXYGEN TANK has capacity of 1,500,000 standard cubic feet of gas. It is supplied by liquid oxygen hauled in semi-trailer.



550-GALLON liquid oxygen storage station is used by a Cleveland steel fabricating firm.

• Argon is used to purge metals of undesirable gases and to provide inert atmospheres for producing metals like titanium.



TYPICAL FLOW DIAGRAM shows how a bulk liquid gas station supplies user's needs.

Military uses for liquid gases include guided missile work and high altitude aviation. Oxygen, hydrogen and fluorine are some of the liquid gases used.

WHO USES LOW TEMPERATURE PROCESSING?

The chemical industries—including major gas suppliers—use low temperature processing to separate gas mixtures and make high purity chemicals more economically. In continuous process plants, air itself and industrial gas mixtures yield tonnage quantities of important materials such as oxygen, nitrogen, hydrogen, ammonia, carbon dioxide, methane, acetylene, and ethylene.

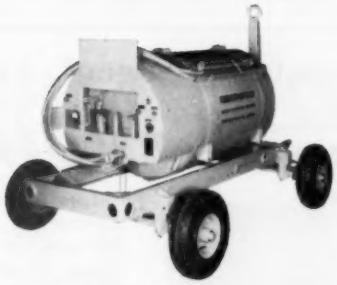
Low temperature separation of other gaseous mixtures now makes it practical to recover new riches from natural gas, refinery gases, coke-oven gases and many other waste gases. Processing can improve the com-

HOW LIQUID GASES ARE TRANSPORTED

MOBILE PUMPER consists of vacuum-insulated liquid tank mounted on a truck chassis.

HAND TRUCK moves cylinder containing 3,000 cubic feet of oxygen.

SPECIAL RAILROAD CAR moves huge quantities of liquid gases.



TRAILER-MOUNTED liquid oxygen container is used by military.

mercial value of various gas products by removing contaminants.

HOW ARE LIQUID GASES MADE?

Liquid gases are made by fractional distillation or partial condensation of the gas mixture.

In fractional distillation of low boiling point gases, you cool a gaseous mixture to the liquefaction point at which temperature all constituents become liquid. By raising the temperature, the constituent gases then boil off in order of their boiling point. This process yields almost pure gases.

Partial condensation is the reverse of distillation. As you cool a mixture, the constituent gases liquefy in order and are drawn off.

Liquid absorbent scrubbing processes and solid absorbent fillers are used to remove any small amounts of contaminants remaining.

HOW ARE LIQUEFIED GASES STORED?

The gas suppliers install a system at a customer's plant. It consists of a vacuum-jacketed storage vessel, a vaporizer, and all necessary regulators and controls. The supplier keeps the tank filled with liquid gas. It is vaporized and piped around the plant.

User stations can range in size from 337 gallons—used primarily in hospitals and small fabricating companies—to 660 gallon containers which are ideal for most manufacturing companies. Larger accounts use 1,200, 2,400, and 4,800 gallon central system tanks. Some may hold up to 11,200 gallons.

Small portable containers holding as little as 30 gallons are available.

The size of the container depends on the average monthly usage and the distance from a producing plant. In other words, the farther away from a source,

the larger the installation. This cuts down on cartage charges.

These storage tanks are built like a Thermos bottle. They are double-walled chambers with a vacuum between. The inner vessel is made from AISI 304 stainless, aluminum, or a 9 percent nickel steel. The outer vessel can be aluminum or carbon steel. In making the vessel, the space between is filled with insulation (perlite, santocel, powdered metals, or layers of aluminum foil and glass fibers) and then air is pumped out.

Despite precautions, some heat does reach the cold liquid gas. This heats the liquid, the inner tank wall, and the insulation touching that wall. Later, when the supplier adds a charge of colder liquid, it absorbs this heat slowly from the liquid in the tank and from the wall and insulation. The fresh liquid grows warmer, and its volume increases. To allow for this expansion, tanks are made with space above the normal depth of the liquid. However, expansion space may not be adequate in those rare cases when no gas or liquid is drawn off for some time after the tank is filled. To remedy this, safety vents are provided.

Since the liquid gases are used mostly in gaseous form, they must be heated and vaporized. This can be done automatically in unattended equipment that will deliver up to rated capacity on demand and will maintain satisfactory pressure in the delivery line.

Storage systems for medium pressure service are designed to deliver vaporized gas to the user's pipe line at a maximum pressure of 175 psi. Heat to warm the liquid gas and vaporize it is obtained from the surrounding air or heated water in the vaporizer.

When the liquid gases are used as liquids, low pressure storage tanks are supplied. If these are vented to receivers at low pressures or to the atmosphere, the temperature of the stored liquid will vary only slightly from its normal boiling point. By installing the storage tanks up high, their contents can be transferred by gravity, or small quantities of stored liquid may be run through a pressurizing vaporizer and the gas from it returned to the vapor space above the liquid. With the vents closed, sufficient pressure is generated to force the liquid from the tank.

HOW ARE LIQUID GASES TRANSPORTED?

Liquid gases are transported in truck-mounted vacuum-jacketed tanks. These are similar to the tanks used in customer installations. One difference is that the outer shell—and sometimes both shells—is usually made of aluminum to increase payload. These trucks deliver either the liquid gas or have vaporizers so they can deliver gas. They can carry up to 2,500 gallons of liquid gas.

Trucks visit customers at regular intervals to fill tanks. The truck is usually weighed on a certified scale before and after filling. The customer gets the certified weight tickets. The difference between the two is the amount of gas delivered.

Use Oxygen? Nitrogen? Argon?

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'MORT CLARK'S GALV-WELD® ALLOY ORIGINAL & GENUINE

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WHY EXPERIMENT?

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Eliminates corrosion areas produced by welding, so that weld will stand up under paint, WITHOUT rust, as on ornamental iron. Simply use residual heat from welding, or reheat, wire brush, and apply. No fluxing—No fumes.

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Circle No. 38 on Reader Service Card.

USE THESE PRECAUTIONS WHEN YOU HANDLE LIQUID GASES . . .

• Avoid contact . . . liquid gases and the gases issuing from them burn the skin just like fire or a hot surface. Delicate members, such as the eyes, can be damaged by an exposure too brief to affect the hands or face.

• Wear protective clothing . . . always wear face shields and gloves, preferably asbestos. When handling liquids in open containers, wear high-top shoes and cuffless trousers outside the shoes.

• Maintain proper ventilation . . . this prevents excessive concentrations of gas which can be a fire hazard or cause asphyxiation.

In selecting and using equipment, make sure you:

• Use only containers specifically designed for holding liquefied gases. These are made from materials which can withstand the rapid changes and extremes of temperature. However, even these special containers should be filled as slowly as possible to reduce thermal shocks that occur when any material is cooled.

• Fill containers only with the liquid they are intended to hold . . . mixing oxygen with any of the other liquid gases can cause fires.

• Use proper transfer equipment . . . use special filling funnels when you pour liquid into a flash or other small container. When it is not safe or convenient to tilt the container, use a discharge tube to remove the liquid gas.

When you install and maintain equipment, make sure you:

• Get competent advice . . . never install equipment or piping without consulting someone with experience in low temperature work.

• Follow maintenance recommendations . . . anyone operating or maintaining equipment must be properly trained and supervised by someone with experience.

• Restrict access to storage units to only authorized persons. Make sure you know where valves and switches are.

In handling liquid or gaseous oxygen keep away all combustible materials, especially grease and oil. Do not permit smoking of open flame in any areas where oxygen is stored or used. Many substances which do not normally burn in air require only a slight spark or moderate heat to set them aflame in the presence of oxygen. Other substances which are only moderately combustible in air burst violently into flame when in oxygen.

Take special precautions with liquid nitrogen and hydrogen. These are available from suppliers.

• • Illustrations and some facts for this article came from the following companies which make cryogenic equipment and/or liquefied gases: Air Products, Inc., Allentown, Pa.; Air Reduction Sales Co., New York City; American Messer Corp., New York City; Burdett Oxygen Company, Cleveland, Ohio; International Acetylene Association, New York City; Linde Company, Division of Union Carbide Corp., New York City; Liquid Carbonic Division of General Dynamics Corp., Chicago; National Cylinder Gas Division of Chemetron Corp., Chicago; Nucledyne Division of Cook Electric Co., Chicago; Project Fabrication Corp., College Point, New York; Ronan & Kunzl, Inc., Marshall, Michigan; Ryan Industries, Inc., Cleveland, Ohio; Standard Steel Corp., Los Angeles; Superior Air Products, Newark, N. J.; Uni-Flex Manufacturing & Engineering, Inc., Los Angeles.

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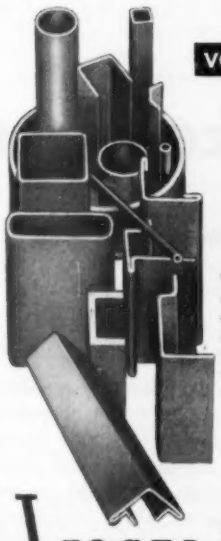
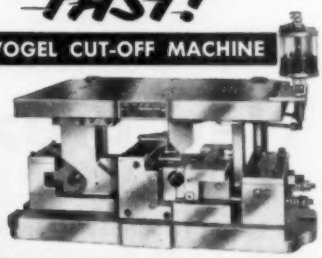
FAST!
VOGEL CUT-OFF MACHINE





With each press stroke, unit accurately cuts off tubing and shapes into lengths of ½" ±.010", or more. The ends are cut clean with a minimum of burr or distortion . . . Shearing blades make thousands of cuts before resharpening.

No. 12 unit cuts up to ¾" O.D. x 3/32" wall.
No. 2 unit cuts up to 2" O.D. x ⅛" wall.
No. 3 unit cuts up to 3" O.D. x 3/16" wall, or up to 3½" O.D. x ⅛" wall.
Odd shapes handled in sizes equivalent to unit's O.D. capacity.

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For More Information Circle No. 79 on Reader Service Card.

1 After U-channels are formed, they are racked on a mandrel that has been cast and machined to the contour of the rocket thrust chamber.

2 Notched clamping devices are used to rack channels that will be ribbon-wrapped and then brazed into a rocket thrust chamber.

3 One hundred thousand spot welds are made on channels to insure close fit and hold dimensional and configuration requirements.

4 While assembly is still on lathe and following electro-grinding, thin ribbons of stainless and strips of copper brazing alloy are wrapped around the turning chamber.

5 Following wrapping, assembly is sprayed with more filler metal to provide an external seal. Then assembly is annealed to hot size channels to chamber's contours.

New Brazed Design Makes Stronger

IN BRIEF: New ribbon-wrap design makes a stronger rocket thrust chamber that is lighter and costs less.

RIBBON-WRAPPED, brazed U-shaped channels—a unique concept in the fabrication of rocket thrust chambers —are being used by Solar Aircraft Co., San Diego. The chambers are being used by the National Aeronautics and Space Administration, Cleveland, to test new high-energy liquid propellants. These propellants require strong heat-resistant rocket thrust chambers.

DESIGN BACKGROUND

Solar had been furnace brazing tube-type regeneratively cooled thrust chambers for major missile and space vehicle programs. But, this new, ribbon-wrap NASA design makes an extremely light (80 pounds including attached hardware) and stronger chamber (for engine thrust range between 13,000 and 26,000 lb) that costs less.

The U-shaped sheet metal channels provide easy, yet precise control of fuel-coolant passage through the chamber. It conducts heat away from the thin metal by varying the fuel-coolant velocity to meet localized heat conditions.

FABRICATION

The first step is to take 360 straight strips of 0.008 inch AM350 stainless steel sheet. A 1-piece die blanks them out, forms and sizes them into a

6 Ribbon-wrapped channel chamber is removed from Solar's brazing furnace at completion of brazing cycle. Hardware is then mounted on the chamber and brazed in place.

Rocket Chambers

U-shaped channel in one operation.

Then 180 of these channels are assembled on a stainless steel split mandrel that was cast and machined to the desired chamber contours. Next, 180 more channels are placed in a second layer at the neck of the hourglass-shaped chamber and gradually fed into a skirt with the other 180.

The channels have their open side facing out. Then they are welded together with about 100,000 spot welds. The welds are made in a specific pattern to insure close fit-up and hold tolerances.

The assembly is then annealed in a hydrogen atmosphere to hot size the channels to exact shape of the mandrel.

Solar then puts the chamber on a special lathe, electro-grinds the channels to height along the entire chamber length. This grinding brings the coolant passages accurately to the shape demanded by the design.

While still on the lathe, the chamber is wrapped tightly with 2,650 feet of 0.008 inch AM350 stainless (same as the channels) steel ribbon. This ribbon, along with a copper brazing ribbon, is wrapped automatically. It comes from a feeding spool geared to the lathe.

BRAZING

After wrapping, additional copper braze filler is sprayed onto the chamber to seal the interlocked ribbons. The chamber is then ready for brazing. This integrates the wrapping and channels into tube-like fuel passages.

Solar uses one of its large 600-KW elevator-type furnaces with multiple zone control for brazing. This is done in a welded muffle with controlled argon or hydrogen atmosphere. During the brazing cycle, the chamber is taken above 1980°F in about one hour.

After brazing the chamber is slowly furnace-cooled to about 1800°F to permit unstressed solidification. Then it is removed from the furnace and air cooled to room temperature. The protective atmosphere is maintained to insure a clean assembly.

Multiple brazing techniques developed by Solar are used in the next step. Hardware attachments—such as fuel manifold, reinforcing rings, and injector flange—are fitted to the chamber and the second brazing operation begins. This is done at about 1875°F, with a copper-tin brazing alloy.

MACHINING, HEAT TREATING AND TESTING

The chamber is then machined to mate the injector and engine mount. The assembly is then heat treated to get the desired metallurgical properties from the precipitation-hardening AM350. This is done in a split cycle of 100°F for three hours followed by three hours at 850°F.

The chamber then undergoes a series of tests including leak pressure using 200 psi helium in the fuel passages while the chamber is submerged in a water tank.

FINISHED PRODUCT

The lightweight chambers are about five feet high and measure 39 inches in diameter at the skirt, 7.8 inches in diameter at the throat and 10.5 inches in diameter at the head.

The fuel manifold fits around the neck. In operation, the fuel enters the chamber at the neck, flows down 180 channels to the gathering at the bottom, then returns up another 180 channels to the fuel injector at the top of the head. • •

why was this skyscraper welded?

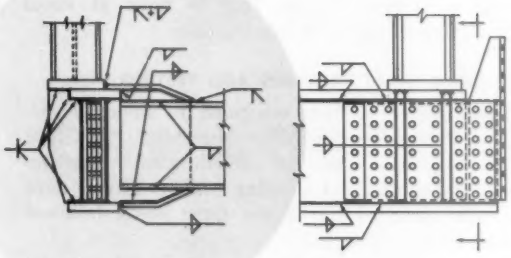
Structural Welding

IN BRIEF: Eight contractors bid on the steelwork for the second tallest welded skyscraper; twelve bids and three construction methods came in. Welding won because it was cheaper, faster, and quieter.

ANOTHER WELDED STEEL SKYSCRAPER is adding its profile to New York's skyline. It is the 31-story Western Electric building which was topped out several weeks ago.

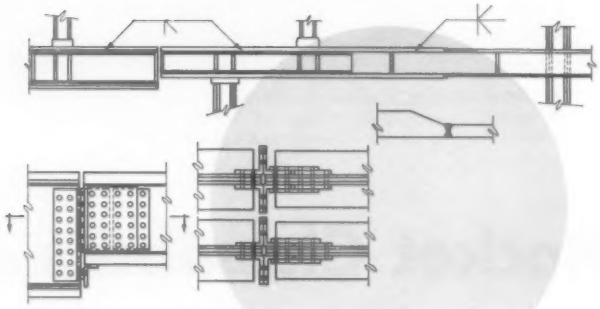
It is the second-tallest welded building in the U.S. Only one other is taller, and that by but one story. Welding is certainly the quietest way of putting up a steel building. But it wasn't noise level that determined its selection; welding was chosen because it cost less.

DESIGN-WELDING DETAILS



CANTILEVER GIRDER. A deep cantilever girder projects above the roof at the 20th floor to reduce the span of the welded girder supporting the column. The girder is about 26 inches deep and is off the center of the supporting girders. The girders and shear reinforcements are made from plates. The field connection is made with high-strength bolts.

The cantilever girder details also provide for the eccentric column. Here, welding is used advantageously. The column base plate and girder stiffeners transfer the column load to the girder and also form part of the cantilever beam.



COLUMN TRANSFER GIRDER. At the 19th floor, the loads from two columns are transferred to three columns below. Two, 30-inch-wide-flange beams with cover plates are used for one span. The other girders, with less room, are fabricated from 20-inch web plates and 16- by 3-inch flange plates. The very thick plates are used to transfer the column load to the two supporting girders.

The cantilever construction is designed to give maximum bending capacity by making the positive and negative moments almost equal and, at the same time, reduce the span of the deeper girder. The details show a very heavy riveted and bolted filed connection.

Is 17 Percent Cheaper Than Bolting

Eight contractors bid on the steelwork. They were asked to bid on riveted, high-strength bolted, or welded connections. Dreier Structural Steel Company's welding proposal was the lowest of twelve; it was up to 17 percent lower than the bolting proposals. Their contract winning bid was 16 percent lower than the other two welding proposals. This isn't surprising; Drier has put up more welded building tonnage than any other fabricator in the country.

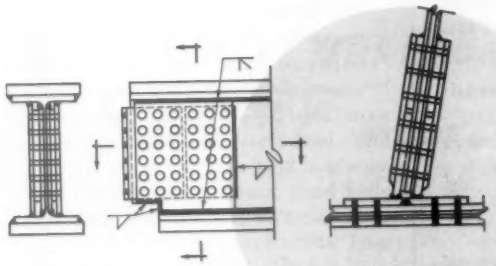
Riveting ran a poor third; hole-punching and rivet driving cost too much. The building designer, Wallace Heidtmann of Purdy & Henderson points out: While welding is cheapest overall, the cheapest beam-to-girder field connections are made with unfinished bolts. Heidtmann also believes that high-strength bolts are more economical than welding for heavy field connections.

Dreier did most of its welding in the shop. It consumed 25 tons of electrodes in the shop, 6 tons in the field. The building took 10,000 tons of structural steel.

Shop equipment included d.c. rectifiers, a.c. transformers, and semi-automatic submerged arc welders. Phil Dreier, shop superintendent, prefers a.c., and expects to replace old machines with them. Field equipment included two diesel motor-generators, one serving eight welding machines, the other four.

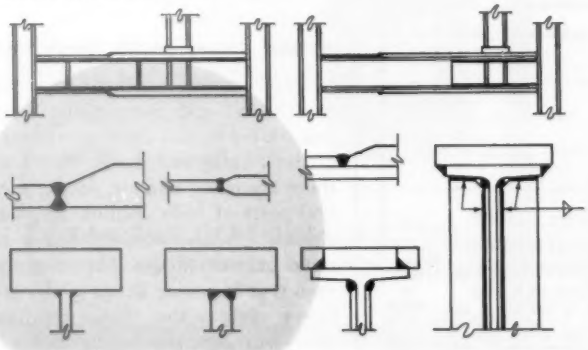
Originally, cover plates for heavy columns and load transfer points were tacked with low-hydrogen electrodes while jacked against the structural members with a 60-ton force, then welding was completed with 6013 and 6014 electrodes. But some of the welds cracked, so Dreier switched to low-hydrogen electrodes for finish welding too. This eliminated the trouble.

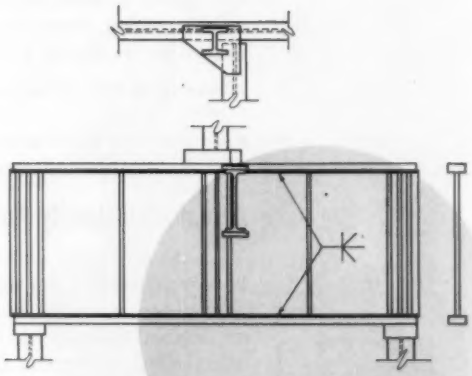
continued on next page



TYPICAL GIRDER WELDING. With more welding experience, details of this sort will probably be welded. Changes in thickness of flange and web plates are made by tapering and butt welding. If welded, flange and web plate thicknesses aren't changed as much as in riveted construction. The saving in material doesn't justify the additional welding.

Thin webs are fillet welded to flanges; thick webs are butt welded. Wide flange sections are preferred because they take less welding. Wide flange sections are often reinforced with plates fillet-welded at the flange fillet.





NARROW, DEEP GIRDER. An unusually narrow and deep girder was needed at the 16th floor to clear a stair opening. The flanges were 9 inches wide by 4 inches thick, the web, 82 inches deep.

Also, the girder is off the center of the supporting columns, which are reinforced by extra cover plates on one side. A triangular billet was required to support the column on two girders and stay clear of the stair opening.

SPECIAL CONNECTIONS. If these girders were at right angles to each other, a pair of heavy angles would have been used. However, when girder do not connect at right angles, a butt-welded plate assembly produces the same effect. The plate against the web of the supporting girder is in two parts to permit welding access.

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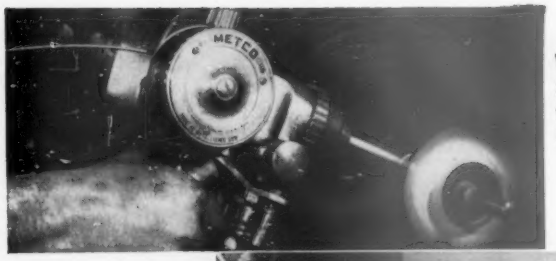

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The steel frame is fireproofed with short-span, lightweight concrete floors, brick walls, and concrete block partitions. The upper floors have less area than the street floors because of a series of set backs. This keeps the building within the envelope set by New York's zoning rules.

The building was actually designed for riveted shop connections and either riveted or bolted field connections with some welded details thrown in because it was more practical. This was done because most buildings had been riveted, and the designers felt that most fabricators were equipped for it and more familiar with it.

BEAM ENDS FREE TO ROTATE

The switch to welding required little change in overall design. This design—designated Type 2 under American Institute of Steel Construction's specification—calls for beams whose ends are free to rotate under load. The free-end design was necessary for three reasons: the irregular column spacing; the location of many beams off column centers; and the many column transfer girders for setbacks.

The beams were designed as simple spans under live and dead loads, and continuous for wind moments. Beams and columns for each floor were used to effectively carry the total moment; the center of resistance was kept near the center of applied load. Special wind connections and concealed diagonal bracing were used where necessary.

Floors were designed for a 60-lb.-live load, plus 20 lb. for movable partitions, and a 20-lb. wind load above the 100-foot level.

The maximum column load is 5,000 kips. Most columns rest on caisson foundations; some 97 footers rest on rock.

DESIGN COMPLICATED THREE WAYS

Two requirements that complicated girder and end connection design: setback loads, and the concealment of girders, ducts, and lights. That's why there are many narrow, deep girders, and pairs of wide, shallow members. Double girders, support heavy columns at many floors. The most common type is a wide flange girder with heavy cover plates. Shear reinforcement was generally required. • •

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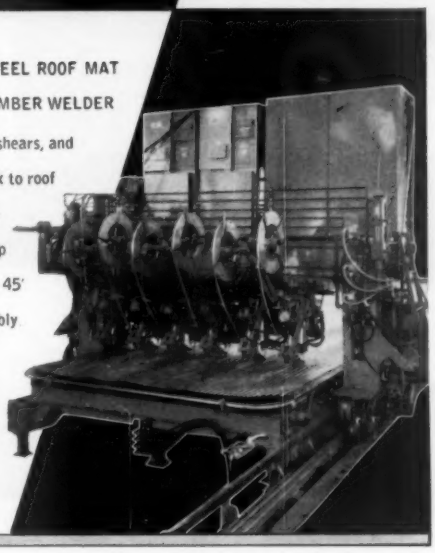
TRAILER ROOF MAT SEAM WELDER

Welds four seams in one direction, shifts, and welds remaining four seams. Length of seam varies from 21 to 45'

STAINLESS STEEL ROOF MAT TO CROSS MEMBER WELDER

Machine feeds, shears, and welds strip stock to roof stock and cross-member stock up to 855 times on 45' long roof assembly

Total time is 18 minutes



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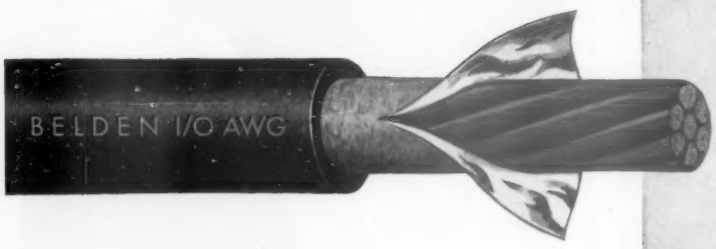

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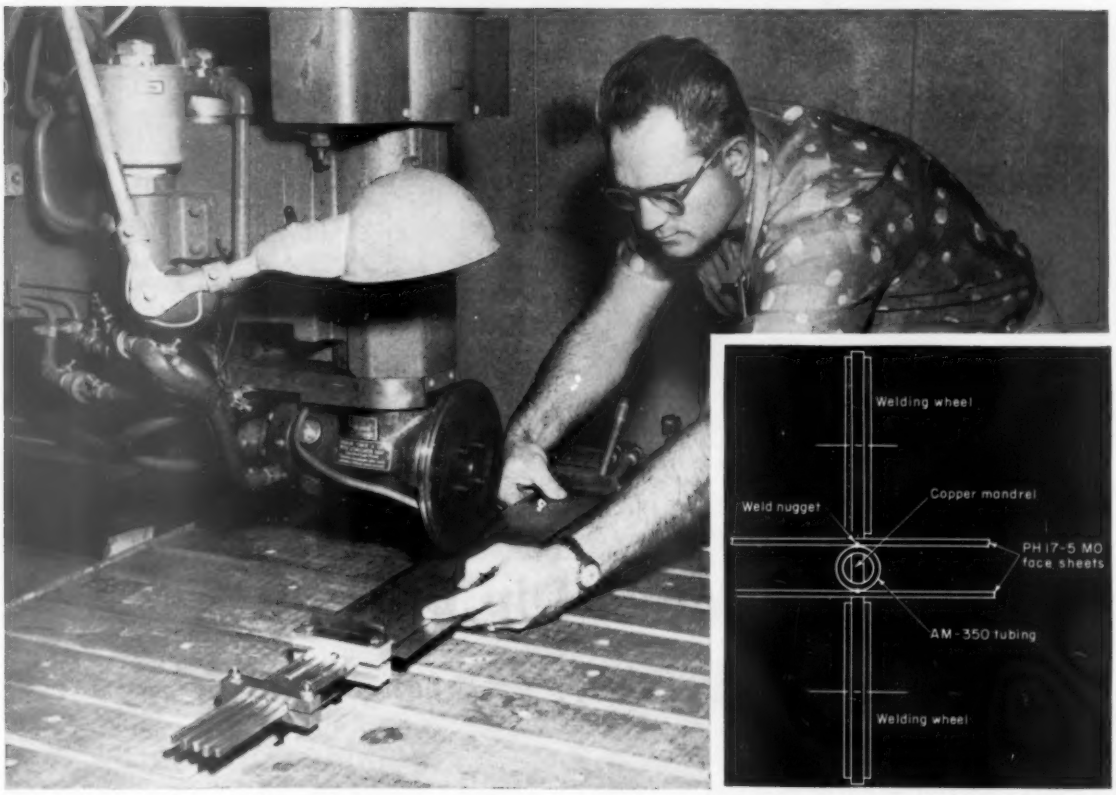

COPPER MANDRELS (sketch) are shaped to permit welding of top and bottom panel sheets to tube at the same time.

IN BRIEF: Chance Vought added the strength of hydraulic tubing to floor panels by resistance welding the two. Result: A stronger, lighter, dual purpose member.

AN UNUSUAL 2-job aircraft part came out of a project Chance Vought Aircraft (Dallas) is doing for the U. S. Navy Bureau of Weapons. The part is unique, because it combines hydraulic tubing with high-strength sheet metal to form a fluid-carrying structural floor panel. This is good for the airframe, and it's good for the hydraulic system.

The panel is 3½ inches wide, 36 inches long. It's a sandwich made of five, side-by-side lengths of tubing between two face sheets. The pieces become a strong, rigid panel when the sheets are resistance welded full length to the tubes.

In the airplane the panel connects to the frame at each end through spot welded angles and a doubler plate. Along the sides, channels connect to frame bulkheads. The panel tubes hook up with the hydraulic system with brazed fittings.

The panel is of stainless steel. The faces are 0.008-inch-thick PH 15-7 Moly alloy. The tubing is used in two sizes of AM-350 alloy: 0.50-inch O.D., 0.022-inch wall, and 0.38-inch O.D., 0.016-inch wall.

The company had to develop new tools and methods to weld the panels; the usual ones wouldn't do. It experimented long to strike the right balance between electrode pressure and the shape of the copper mandrels used inside the tubes. It wanted to weld face sheets and tubing at the same time.

The 2-purpose panel is better than separate construction for three reasons: It's stronger, it saves space; and it's one-fourth lighter. The tubes support the face sheets full-length. Contrast this with the old way: the tubing hung from the panel with brackets and clamps at a few points, adding nothing to its strength. The new design is better for the hydraulic system too. The tubes are better protected.

What does the new idea in fluid-line panels mean to airframe designers? It means that they'll have to think about the fluid system before designing the airframe, not after. The savings, the uniformity, and the extra strength will make it worth while. • •

1 Threaded collar is held against rectangular waveguide tube by applying spring and slipping a small wire through the hook in the spring end (top). Plates, round tubes, and circles are held to rectangular tube by springs with ends passing through cavity (bottom). Notched plates slipped over bulb on spring end hold assembly together for brazing.

2 After preheating at 1000°F for 15 to 30 minutes, complete assembly is brazed by dipping it in a salt bath for several minutes. Cooling and washing in warm water complete the job.

Alloy Springs Make Dip Brazing Simpler, Faster, More Accurate

IN BRIEF: New alloy springs need not be reshaped after use and stand up through hundreds of operations at 1100° and 1400°F.

N.R.K. Manufacturing and Engineering Co. had been using cumbersome weights, intricate fixtures, and laborious tack welding to assemble brass parts for dip brazing at 1400°F. The Chicago company makes microwave assemblies and radar components.

PROBLEM

N.R.K. could not hold the assemblies together with springs because no spring wire stayed springy at the 1400°F of the bath. The pieces had to be held firmly together and with proper joint clearance to get a good brazed joint.

For dip brazing aluminum at 1100°F, the company had been using stainless steel springs. Even at this lower temperature, the springs deformed and had to be replaced after 60 or 70 uses.

SOLUTION

N.R.K. made some new springs from a special NS-25 alloy steel wire furnished by National-Standard Company, Niles, Michigan. They standardized on them, using them wherever they use spring fixturing, from pilot runs to production runs.

RESULTS

The company reports the NS-25 springs need not be reshaped after use. They stand up through hundreds of brazing operations at 1100°F and 1400°F without any visible changes in properties.

This mechanical stability insures proper expansion of parts during heat. If the spring tension is too great, the parts deform. If tension is too little, the joint is poor. Typical tolerances on complicated microwave assemblies are plus or minus 0.002 inches.

BRAZING TECHNIQUES

Schedules are almost identical for brass and aluminum parts.

Parts are assembled and held in place by the NS-25 springs. Assemblers place a shim of brazing alloy between the parts. Or, they apply some liquid brazing compound.

The assemblies are hung on hangars or set in perforated tote baskets. They are preheated at 1000°F for 15 to 30 minutes and brazed by dipping in a salt bath for several minutes.

Some of the parts are quenched rapidly. Others are cooled slowly. Cooled parts are washed in warm water to remove corrosive flux picked up in the brazing bath.

Springs are removed after washing and returned to the assembly bench. • •

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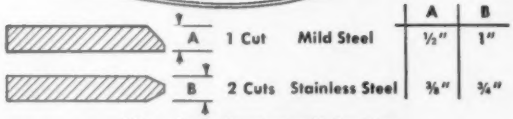

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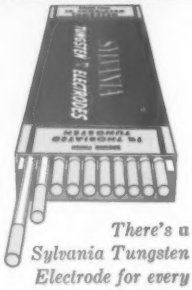

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Airco Offers Welding Fellowship

COLUMBUS, OHIO: A full-time Fellowship in welding engineering at Ohio State University is being offered by Air Reduction Co.

The fellow will pursue a full time graduate program in the Department of Welding Engineering. The fellowship will carry a stipend of $2,400 a year to unmarried, and $3,000 yearly for married recipients.

Application blanks may be secured by addressing the Department of Welding Engineering at Room 128, Industrial Engineering Bldg, Ohio State University, Columbus 10, Ohio.

Arcos Opens New Los Angeles Warehouse

LOS ANGELES: Arcos Corporation of Philadelphia has moved from 123 South Santa Fe Avenue to a new warehouse-sales office building at 6222 Chalet Drive, Bell Gardens, Los Angeles.

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Conference Course On Nondestructive Testing

COLUMBUS, OHIO: The Summer Conference Course on Fundamental Principles of Nondestructive Testing will again be presented by the Department of Welding Engineering of State University from September 12-23, 1960.

This intensive two week course is intended to train personnel in the fundamental principles and proper applications of nondestructive testing. Registration fee is $200. Apply to the Department of Welding Engineering, 190 West 19th Avenue, Ohio State University, Columbus 10, Ohio.

New Carton Guards NCG Electrodes

CHICAGO: A new, moisture-resistant carton for arc welding electrodes provides effective protection against corrosion, according to National Cylinder Gas Division of Chemetron Corp. The box, which will be used to package NCG's Sureweld electrodes, is opened easily by a tear-tape. A color code will identify the type of electrode it contains.

Ransome Sells Welding Control

LOS ANGELES: Ransome Company, Scotch Plains, N. J., has been appointed national sales agents for a portable remote foot control for welding machines by Mullenbach Division of Electric Machinery Mfg. Co. Mullenbach will continue to service selected established accounts.

Tweco Products Opens Eastern Division Office

WICHITA, KANSAS: The opening of their Eastern Division Office and warehouse at West Caldwell, N. J., has been announced by Tweco Products, Inc. A complete stock of Tweco arc welding accessories will be warehoused at this point to serve distributors and users in the Eastern seaboard states and Vermont, Pennsylvania, and West Virginia.

Donn Boring is district manager.

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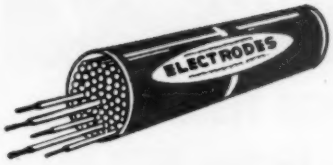

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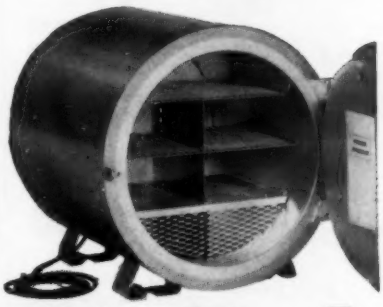

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Circle No. 75 on Reader Service Card.

REFERENCE DATA *catalogs, handbooks, manuals*

A NEW HARDSURFACING electrode for use on carbon and austenitic manganese steel parts is featured in a data sheet. Full details on characteristics, physical properties, weld metal composition, and applications are given for McKay Company's Hardalloy "44" manual electrode.

Circle No. 300 on Reader Service Card

GAS TRANSPORTS AND STORAGE TUBES made by Taylor-Wharton Co. and Harrisburg Steel Co. are featured in a 4-page, illustrated catalog. Gas transport capacities are given also with standard tube dimensions.

Circle No. 301 on Reader Service Card

AIR-COOLED ELECTRODE HOLDERS for heavy-duty metallic welding are described and illustrated in a new data sheet by J. B. Nottingham & Co., Inc. The holders' ratings and specifications are given along with design and construction features.

Circle No. 302 on Reader Service Card

CARBON-GRAPHITE electrodes used with the Arcair Company's carbon arc-compressed air gouging process are described in new literature. Suggested current settings are given for each electrode size.

Circle No. 303 on Reader Service Card

TUBULAR COILED WIRE for automatic and semi-automatic hardsurfacing is featured in a catalog sheet from Rankin Mfg. Company. The literature describes the company's new Ranomatic wire in detail, explaining how four different alloy-types provide balanced hardness, toughness, and wearing characteristics for every job.

Circle No. 63 on Reader Service Card

SELENIUM RECTIFIERS made by Miller Electric Mfg. Co. are featured in a new 12-page three-color brochure. Design and manufacture is explained and operating characteristics are given.

Circle No. 305 on Reader Service Card

LIQUID GAS STORAGE and conversion stations for installation on customer property are featured in a 6-page brochure issued by Air Reduction Sales Company. The brochure lists the advantages of liquified gas storage and describes in detail types and sizes of stations for medium and low pressure applications.

Circle No. 306 on Reader Service Card

EIGHT FACTORS to consider in selecting arc welding electrodes are explained in a handy, pocket-size card offered by Hobart Bros. Application information is given. Mild steel arc welding electrodes are identified.

Circle No. 307 on Reader Service Card

SEMI-AUTOMATIC flux-and-CO_2-shielded processes for welding steel are described in two new pieces of literature issued by the Linde Company, Division of Union Carbide Corp. Catalog F-1379 describes the company's Unionarc line. Booklet F-1376 contains case histories.

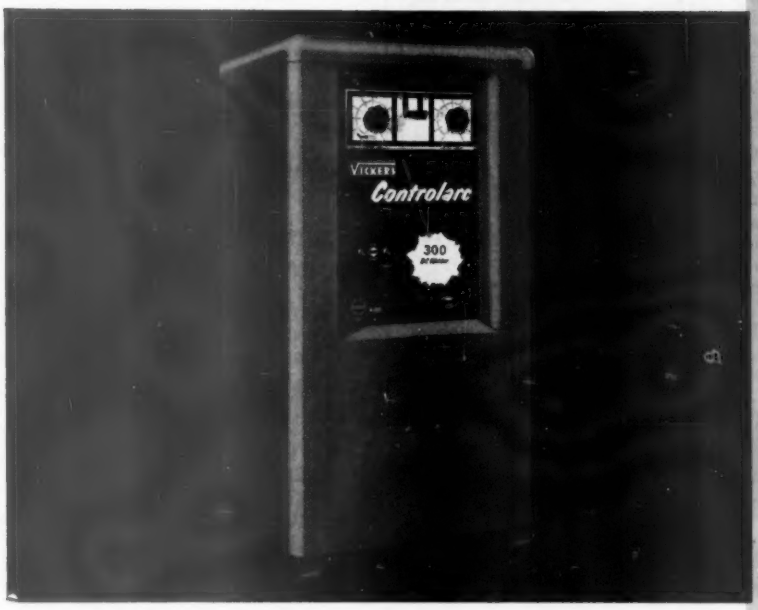
Circle No. 308 on Reader Service Card

FACTS AT YOUR FINGERTIPS: *If you want copies of the catalogs featured on these pages, just circle the appropriate numbers on the bound-in Reader Service Card. We'll do the rest.*

For heavy plate to thinnest alloys

VICKERS Controlarc*

MAGNETIC AMPLIFIER DC WELDER... AND ACCESSORIES



- Maintains arc stability through the complete current range from extremely low to extremely high without range switches.
- Bends the volt-ampere curve to meet the particular welding job being done.
- Full-range automatic arc control in any welding position.
- Strikes an arc without the use of high frequency when using inert gas and tungsten on lowest currents.
- Exclusive, patented Magnetic Amplifier combines fine control with ruggedness and durability.
- Exclusive, *dual* remote control equipment available . . . provides close control of current and voltage range.
- Low spatter performance on special electrodes.

*TRADEMARK

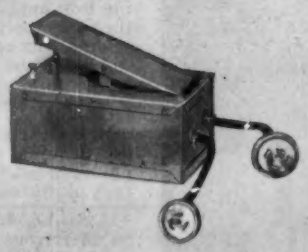
Write for complete information on this equipment and for other high quality—high performance welding machines under development.

SLOPE CONTROLLER
for automatic tungsten inert gas welding; using Vickers standard *drooping* (not constant potential) output welding power source. Linear—static—exclusive design.

INERT GAS WELDING CONTROL UNIT
With or without timer adjustable pre-flow of inert gas and water.

INERT GAS SPOT WELDING TIMER UNIT
for TIG guns which are high frequency started (Tungsten contact not required for initiation). Timer calibrated for 3 to 360 cycles.

REMOTE HAND AND FOOT CONTROLS
Many designs available for special applications.



VICKERS INCORPORATED

DIVISION OF SPERRY RAND CORPORATION

ELECTRIC PRODUCTS DIVISION

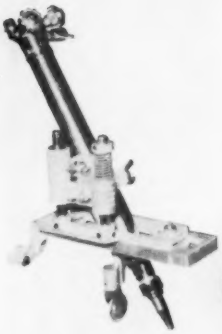
1855 LOCUST STREET • SAINT LOUIS 3, MISSOURI

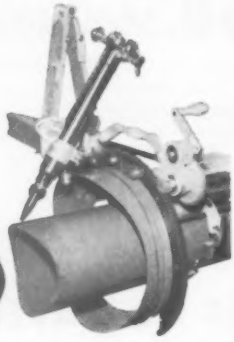
For More Information Circle No. 77 on Reader Service Card.

For More Information Circle No. 41 on Reader Service Card.

Patent No. 2,843,373 Patent applied for

make the TOUGH JOBS EASY with H&M





H&M OUT-OF-ROUND for imperfect pipe Features a free-wheeling roller assembly that swivels a full 360° — rides the pipe surface and is controlled by a unique spring tension that makes corrections for any eccentricities — eliminates inaccurate cuts and bevels.

H&M SHAPE CUTTER for intersectional cutting Cut saddles and miters for the fabrication of tees, els and other irregular designs simply, easily with the H&M Shape Cutter. The machine uses pattern templets to insure accurate cutting and produce precision design work.

The Shape Cutter and Out-of-Round are available in a full range of sizes to fit all H&M Pipe Cutting and Beveling Machines. Write for catalog sheets on the complete H&M line, Today!

H&M PIPE BEVELING MACHINE COMPANY

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TM Reg TULSA, OKLAHOMA

to get the best joint, use the right

FLUX

you name it—ALL-STATE has it

ALL-STATE makes quality fluxes for torch and soldering iron applications on all commercial metals . . . in the form you prefer: liquid, paste, powder, flux cored solders, flux coated rods. Working temperatures range from 300F to 2200F. Designed for maximum wetting action, minimum fuming. For instance:

DUZALL . . . a new liquid flux for all soft solders, all metals (except light metals). DUZALL eliminates pre-cleaning, increases capillary action, leaves minimum deposit. Comes in handy 4 oz. refillable dispenser-type plastic containers, and in larger units.

#11 BRAZALOY® . . . a paste or powder flux for use on 14 ferrous and bronze alloys. Wide temperature range: 1200F to 2200F. Non-corrosive, non-fuming. Also available extruded on Nickel Silver welding rods.

#31 BRAZALOY® . . . a highly active aluminum brazing flux that gives maximum wetting action, excellent capillary flow. Protects surfaces from discoloration, requires less after-cleaning. An outstanding temperature indicator.

S200 SILVER BRAZING FLUX . . . melts at 600F, becomes transparent at 1100F, protects heated base metal to 1800F. Induces excellent capillary action and flow of silver alloys.

Send for free copy of 54-page Instruction Manual and for information on custom coating your welding rods.

All-State's JET FLUX® and JET FLUX DISPENSER® on production line at Griggs Manufacturing Co. Acetylene and Jet Flux mixed and fed automatically from Dispenser.

Distributor-Stocked, convenient to buy. Economical to use.

ALL-STATE WELDING ALLOYS CO., INC., White Plains, N. Y.

Call WHite Plains 8-4646 or write for nearest distributor

For More Information Circle No. 4 on Reader Service Card.

HELMETS for complete, comfortable safety are featured in a catalog from Dockson Corp. Catalog describes tough, one-piece, rivetless, moulded-fiber construction.

Circle No. 309 on Reader Service Card

RECLAMATION of worn tractor parts is the subject of literature issued by Stulz-Sickles Co. Manganese-nickel and high carbon steel tractor grouser bars are featured.

Circle No. 310 on Reader Service Card

REBUILDING machines for tractor rollers, idlers, and links are featured in literature from Victor Equipment Co. A wide variety of machines are described and illustrated.

Circle No. 311 on Reader Service Card

CUSTOM TOOLING for automatic welding is discussed in a catalog from Ransome Co. The company explains how special problems are "job fitted" by Ransome designers and engineers.

Circle No. 312 on Reader Service Card

LIGHTWEIGHT ELECTRODE HOLDERS are the subject of literature from Jackson Products. How aluminum-alloy allows weight savings up to 35%, yet retains durability is explained in detail.

Circle No. 313 on Reader Service Card

MINIATURIZED TOGGLE CLAMPS are featured in Bulletin #102105 available from Detroit Stamping Co. Vertical and improved horizontal-handle clamps are shown.

Circle No. 314 on Reader Service Card

COMFORT with protection is the word for helmets featured by Fibre-Metal Products Co. in Catalog No. 26. Helmets have beaded edge for increased strength.

Circle No. 315 on Reader Service Card

A CONTOUR CUTTER for pipe fabrication is featured in a booklet from Steffan Mfg. Corp. Included are complete specifications and comparative costs.

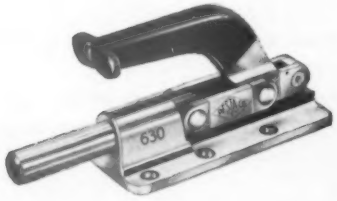
Circle No. 316 on Reader Service Card

IT'S A FACT

YOU CAN DO BETTER WITH

DE-STA-CO

TOGGLE CLAMPS



LIKE THE NEW MODEL 630

Designed for jobs requiring fast holding action, the new 630 is a medium duty, plunger type that locks in either push or pull position—has holding pressure of 1600 pounds. Flared end, heavy Vinyl-covered safety handle. Solid one piece forged base—large diameter bearings—heavy steel linkage—plunger copper plated with Irrelac finish.

OVER 140 OTHER MODELS

Choose from 13 standard styles, over 140 models—holding power from 50 to 12,000 pounds—Templates available on request.

FOR MORE FACTS
REQUEST INFORMATIVE CATALOG
YOU CAN DEPEND ON DE-STA-CO

DETROIT STAMPING COMPANY
350 MIDLAND AVENUE
DETROIT 3, MICHIGAN

Circle No. 25 on Reader Service Card.

"INSTRUCTIONS FOR USING Tempilstiks" is the title of a data sheet issued by Tempil Corp. The sheet contains a number of useful suggestions for determining temperatures in industrial applications.

Circle No. 318 on Reader Service Card

RADIOGRAPHIC TESTING is speeded up to 300% by Day Pack Roll Film illustrated in a 6-page brochure from Dupont. The versatility of the film is discussed in detail.

Circle No. 319 on Reader Service Card

PORTABLE NIBBLERS ranging from light to heavy-duty units are the subject of a new brochure issued by Fenway Machine Co. Cutting capacities of the air- and electric-powered units are featured.

Circle No. 320 on Reader Service Card

FLUORESCENT PENETRANTS for non-destructive testing are featured in a brochure issued by Curtiss-Wright. Characteristics of penetrants, emulsifiers, developers, and X-Ray additive are explained.

Circle No. 321 on Reader Service Card

WELDING FUMES are eliminated at their source by the fume collector featured in a brochure from Ruemelin Mfg. Co. Described is a new counterbalance that permits easier handling of the collector.

Circle No. 65 on Reader Service Card

MACHINE BAND SAWING of delicate work or heavy solids (to 18" square) is the subject of Bulletin 875 prepared by Armstrong-Blum Mfg. Co. Literature explains how the company's No. 8 machine simplifies almost any job: angular cuts, special shapes, coping, and mitering.

Circle No. 15 on Reader Service Card

BRAZING IDEAS describing time- and money-saving applications of Easy-Flo silver brazing alloy are contained in Brazing News #83 published by Handy & Harman. Five illustrated cases tell how the alloy was used, why it was used, and what the advantages of its uses were.

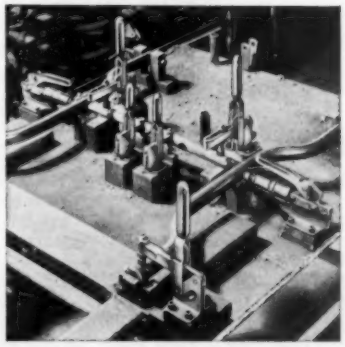
Circle No. 323 on Reader Service Card

IT'S A FACT

YOU CAN DO BETTER WITH

DE-STA-CO

TOGGLE CLAMP SECURITY



BECAUSE when you have the work held by De-Sta-Co clamps you know it will stay put until the job is done.

BECAUSE there's a De-Sta-Co clamp immediately available with just the holding power you need for any job—large or small.

BECAUSE you can choose from over 140 models that will push, pull or lock with forces from 50 to 10,000 pounds.

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Circle No. 26 on Reader Service Card.

For More Information Circle No. 24 on Reader Service Card.

GLAD YOU INVESTED YOUR MONEY THIS YEAR IN **COYNE ACETYLENE CYLINDERS.** COYNE "92" is the quality cylinder that gives you more for your money: appreciates more in value through the years: and is built for more years of service. Don't invest today without thinking of tomorrow.

Write or phone for the details. COYNE cylinder company

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155 WEST BODLEY AVENUE, MEMPHIS, TENNESSEE, WHITEHALL 8-7789
3800 SPRINGDALE AVENUE, GLENVIEW, ILLINOIS, PARK 4-3828
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THE ONLY IRON WORKER OF ITS KIND ON THE MARKET TODAY

No Grinding Necessary After Cut. One Stroke Cycle Clutch Operated by Hand or Foot.

The Bateman "Bantam" cuts 2" x 2" x ¼" angles and ¼" x 4" flats. Standard punches will fit this machine. The Coper will cope 1¼" through ⅛" material. It will punch ½" hole through ¼" material. With the clutch open, the Bantam will make 44 strokes per minute. It is made of high-grade cast iron, with the clutch, pin and dog made of hardened steel. The blades are made with tool steel. It is powered with a fly wheel and gear drive, and uses a small ¼ hp motor, 1750 rpm.

Bateman Bantam with punch....$575.00
Shear only ----------$495.00
Shipping wt. 750 lbs.

BATEMAN FOUNDRY & MACHINE
MINERAL WELLS, TEXAS

Circle No. 17 on Reader Service Card.

NEW PORTABLE SINGER SCREEN **PROTECTION ON ALL 4 SIDES**

NOW — a lightweight portable screen designed for complete enclosure. Easy, fast slip-joint assembly (no threads). Rust-proof finish. In 3 curtain materials:

JOHNS-MANVILLE ALUMINIZED ASBESTOS cloth — the last word in protection . . . neoprene-coated *FIBER GLASS* . . . 12 oz. fire-resistant *DUCK*. All sizes. Also available in single and three-sided models. Ask your dealer or write us.

16 PAGE CATALOG
Complete line of work gloves, welding gloves and safety clothing.

Special Products Division
SINGER GLOVE MFG. CO.
860 W. Weed St., CHICAGO 22, ILL.

SEE OUR AD IN WELDING DATA BOOK

Circle No. 68 on Reader Service Card.

USEFUL LITERATURE *continued*

CUSTOM SHAPES for welding- and induction heating-jigs and fixtures are featured in a colorful data sheet issued by Diamonite Products Mfg. Co. Material properties and characteristics are included.

Circle No. 324 on Reader Service Card

SMOOTH-SURFACED, quality-built, Hackney high pressure gas cylinders are described in literature from Pressed Steel Tank Co. A variety of sizes and shapes are featured.

Circle No. 325 on Reader Service Card

GALVANIZING WELDS is made simple and economical by Galvalloy, the subject of a data sheet from Metalloy Products Co. A test sample is offered.

Circle No. 326 on Reader Service Card

CRYOGENIC EQUIPMENT made by Uni-flex Mfg. & Engrg. Inc., is featured in a complete illustrated brochure explains why company is also source for expansion joints and high-temperature processing equipment.

Circle No. 76 on Reader Service Card

TRANSITION COUPLINGS for aluminum-stainless steel pipe connections in cryogenic applications are described in a brochure from Project Fabrication Corp. Pressure-tight couplings without flanges or gaskets are available in butt- and socket-weld types.

Circle No. 328 on Reader Service Card

THE OLD WORLD CRAFTSMANSHIP of the new Gloor Expeditor is the subject of literature from Earth Equipment Corp. The Swiss machine will magnetically duplicate a template, trace a sketch or blueprint, and automatically make circular or straight cuts.

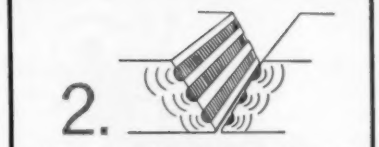
Circle No. 29 on Reader Service Card

CARBON ARC WELDING and where to use it is the subject of a new instuction manual issued by Arcair Company. The manual describes the operation and use of the twin electrode carbon arc welding process.

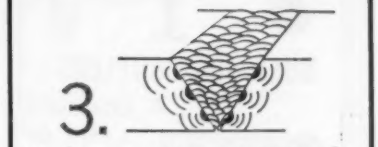
Circle No. 330 on Reader Service Card

NEVER SAY "CAN'T WELD IT"... Case in point: Midwest shop was given a broken cast iron oil sump to repair. Conventional weld attempts failed due to oil and crack-sensitivity. Porosity and voids resulted. Then they called in Eutectic. Our man-on-the-spot prescribed the cure: our trouble-shooting trio of ChamferTrode®, EutecTrode® 27, and QuenchTrode* 24. Watch them!

1. Weldor vees out area with ChamferTrode, and makes grooves in side of vee to relieve stress.



2. Now he "paints" over entire vee surface with EutecTrode 27, filling grooves as he goes. EutecTrode 27 bonds to the oiliest surface, gives base for joining.



3. Final step: weldor makes joint with QuenchTrode 24, using stringer passes and cold-to-hot back-step method. He quenches with wet rag after each pass, till complete fill is made.

RESULT: A strong, permanent, machinable weld, in a fraction of the usual time. No distortion, stress, or cracking. NOTE: the "Quench Weld" process is equally effective for building up missing metal sections or joining steel to cast iron. This is but one example of how Eutectic helps you.

For the finest in quality products, always turn to Eutectic. Service, on the job, any time, anywhere.

O.K., Eutectic, Prove It!
I want a demonstration of the Quench Weld Process.

Name .....
Company .....
Address .....
My title .....

*Patent Pending ® Reg. T.M. Eutectic Welding Alloys Corp.

The Temperature's EUTECTIC WELDING ALLOYS

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EUTECTIC WELDING ALLOYS CORPORATION

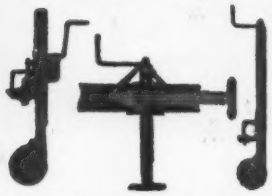
For More Information Circle No. 35 on Reader Service Card.

a constant source of business for you...

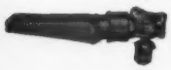
A complete line of - Axle Assemblies, Trailer Undercarriages, Farm & Trailer Jacks, Implement & Trailer Couplers, Spindle End Assemblies

BULL DOG AXLE ASSEMBLIES

BULL DOG JACKS



BULL DOG COUPLERS



A COMPLETE LINE OF COUPLERS

SPINDLE END ASSEMBLIES

Complete Spindle End Assemblies for 2,500, 4,000 and 5,000 lb. capacities Per Pair. Available in complete assemblies or individual parts — Spindle Ends, Hubs, Wheels.

Contact our engineering department for full details on your particular application — a FREE service to you — write for Catalog 18-K.

NEVER LETS GO

HAMMER BLOW TOOL CO.

WAUSAU • WISCONSIN

Circle No. 42 on Reader Service Card.

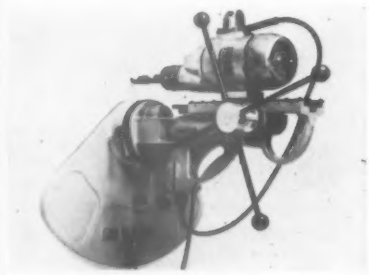
NEW PRODUCTS

Bench-Mounted Welding Head For Electronic Parts

Weldmatic Div. of Unitek Corp. has announced a new Model 1037 bench-mounted welding head. It features twin ballbearing races for precise control of weld placement. This design permits linear movement of the upper electrode, eliminating electrode wiping action as pre-set electrode pressure (variable from 2 to 50 lbs) is applied to critical electronic applications.

Plug-in interconnectors permit the unit to be set up with any stored-energy power supply. Versatility is increased by use of interchangeable electrodes of various types. Electrode pressure is adjustable and repeatable by knob control. A foot pedal with 5:1 mechanical advantage actuates the upper electrode arm. Combined with a capacitor-discharge power supply, the Model 1037 provides millisecond metal-to-metal fusion without heat damage, cold joints or excessive discoloration.

Circle No. 200 on Reader Service Card



Vacuum-Base Drill Stand

A new portable drill stand with a powerful vacuum base has been developed by Bux Magnetic Products, Inc. This new unit will fasten itself to any non-ferrous material with up to 3000 lbs. holding force. The Vacu-Press has a radial positioner which permits rotating the drill point a full 190° about the base. Lateral movement is up to 1⅛" for accurate positioning after base has been positioned on the workpiece.

The portable Vacu-Press weighs less than 65 lbs. It is adaptable to all makes and models of portable drills. Drills up to 3".

Circle No. 201 on Reader Service Card

Hardsurfacing Flux

Hobart Autoflux H-950 is an inert automatic welding flux developed for use with automatic submerged arc hard-surfacing wires. It will not cause complicated alloying effects with the deposited weld metal. Hardness, ductility and work hardening of weld metal is determined by alloying content of the wires *only*, when using this flux.

Circle No. 202 on Reader Service Card

FACTS AT YOUR FINGERTIPS: *If you want information on products featured on these pages, just circle the appropriate numbers on the bound-in Reader Service Card. We'll do the rest.*

For More Information Circle No. 53 on Reader Service Card.

Cut the Cost of Quality!
FIND CRACKS
FAST
WITH MAGNAFLUX
Spotcheck
DYE PENETRANT INSPECTION

EASY . . .
ALL MATERIALS IN SPRAY CANS

FIRE-SAFE . . .
or Chlorine-Free Formulas—SPECIFY

SPOTCHECK SAVES YOU MONEY!
Finds cracks and defects *you can't see*. Finds the cause of in-plant rejects and costly returns later. Simple, positive, fast, easy! Low-cost Spotcheck ends visual guesswork about defects open to the surface in any solid, nonporous material or part. Just spray it on from Spotcheck push-button cans. Cracks and defects open to the surface "pop" out bright red against white background. You can't miss them! Used and preferred in *thousands* of plants over other dye penetrant tests.

COMPLETE SK-3 KIT only $36.00

2 spray cans Penetrant, 2 spray cans Developer, 4 spray cans Cleaner-Dye Remover, instructions, cleaning cloth, wire brush. Steel CABINET-CARRYING CASE. Specify FIRE-SAFE or chlorine-free materials.

Prices: Continental U.S.A. only and Hawaii, F.O.B. our plant, Chicago, Illinois, plus local taxes.

ORDER FROM YOUR DISTRIBUTOR — or direct
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A Subsidiary of General Mills
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THERE'S NOTHING ELSE LIKE FIBRE-METAL'S NEW...FULL VIEW
#55 Sologoggle™

A "Picture Window" View and Maximum Safety for BRAZING, CUTTING, GAS WELDING, GRINDING and similar hazards.

COOL, LIGHT, COMFORTABLE

No. F-550 "Solo goggle" . . . with Headrest for snug or ventilated off-the-face wear. Wide Range Adjustment fits any head size.

INSIDE VIEW of "Solo goggle" . . . showing patented (Designed for Safety) positive retention spring. Lens easy to replace.

This NEW single-cup "Solo goggle" fits easily over Spectacle goggles and personal prescription glasses *for extra protection*. Molded of light, rugged plastic, *"Solo goggle"* is flame resistant and non-irritating to the skin. A *patented spring retainer* makes the filter lens and cover glass easy to change. The spring is of one-piece design . . . SAFE because it has no sharp ends or edges. "Solo goggle" affords a full, unobstructed view of work! *Order this newest and best eye protection NOW from your Safety and Welding Distributor!*

ASK YOUR SAFETY & WELDING SUPPLY DISTRIBUTOR for Bulletin #53, or WRITE US.

The FIBRE-METAL Products Company | CHESTER PENNA.

For More Information Circle No. 36 on Reader Service Card.

Good AS NEW!
Better THAN NEW!
MOGUL®
METALLIZED PARTS
SAVE MONEY FOR CUSTOMERS--
ADD PROFITS FOR YOUR SHOP

RECLAIM
REBUILD
and
SALVAGE
1001 METAL PARTS
by *spraying* carbon and stainless steels, babbitts, bronze, nickel, brass, tin, aluminum, zinc; hard ceramic facings.

TURBO-JET with new MAGNETIC AIR CONTROL sprays wires or rods.

POWDER-JET GUNS spray ceramic and metal powders *from any angle.*

A TINY FRACTION of the REPLACEMENT COST *gives new service-life* to WORN OR BROKEN PARTS . . . *salvages* MIS-MACHINED PARTS for even the biggest, heaviest installations such as: hydro-electric turbine shafts, pump shaft sleeves, etc. *And more* . . . PRODUCTION SPRAYING for manufacturers improves wear resistance, prevents corrosion, provides smooth surface for baked finish, etc.

ADD MOGUL HIGH-PROFIT, LOW-COST EQUIPMENT THAT PAYS FOR ITSELF IN PROFITS!

Get the Big Money Story NOW!

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DISTRIBUTORS: A few choice territories still available. Write or phone for details today.

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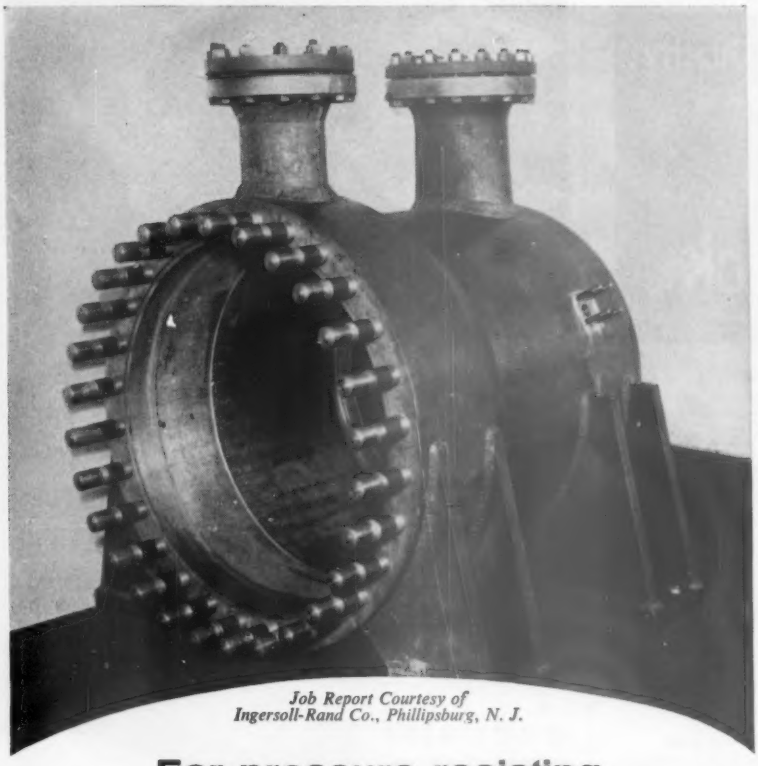
For More Information Circle No. 55 on Reader Service Card.



Job Report Courtesy of
Ingersoll-Rand Co., Phillipsburg, N. J.

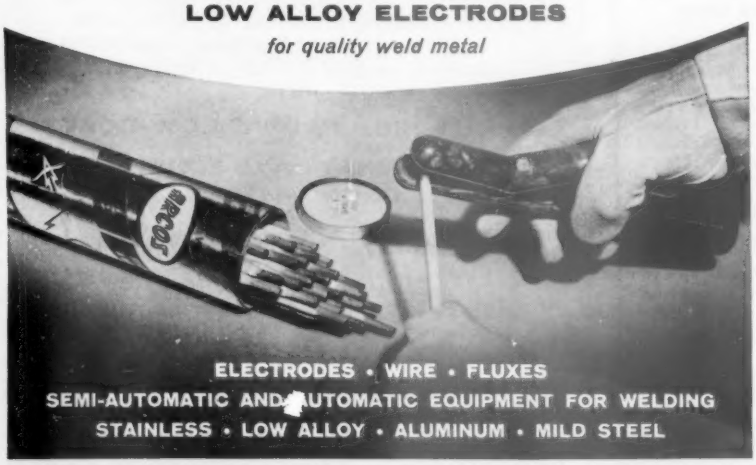
For pressure resisting high strength low alloy welds

The intake and discharge nozzle welds on this re-cycle compressor casing must provide high strength for long service life under rugged conditions. To assure sound, crack-free welds, Arcos Tensilend 70 Electrodes were used. These electrodes, especially suited for welding mild steel and low-alloy high-tensile steels, produce welds with a yield of 70,000 psi in the *as welded* condition. Use Arcos electrodes for the same dependable performance.

WELD WITH ARCOS

LOW ALLOY ELECTRODES

for quality weld metal


ARCOS
ELECTRODES • WIRE • FLUXES
SEMI-AUTOMATIC AND AUTOMATIC EQUIPMENT FOR WELDING
STAINLESS • LOW ALLOY • ALUMINUM • MILD STEEL

ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.

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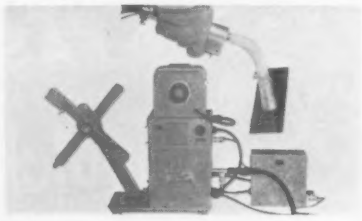


Metal-Arc Spot Welding

A new metal-inert-gas-shielded-arc spot welding unit has been announced by Hobart Bros. Co. With this unit, most metals .030″ to .25″ can be spot welded from one side. It can be used to plug weld metals .125″ thickness and greater.

The equipment can produce over 20 spots per minute using gas-shielding mixtures. A minimum of weld spatter makes metal cleaning unnecessary.

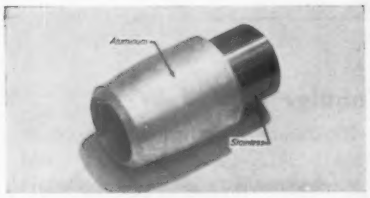
The operator first places the gun against the work, squeezes and releases the trigger. An instant before the arc is initiated, the contactor closes and gas preflows to shield the weld zone. As the arc is struck, wire is fed from a coil into the weld at a predetermined constant rate. Duration of the arc spotweld is controlled by the timer panel. At the end of the weld time, the crater-fill circuit comes on for a short time and the timer permits a short flow of gas. The cycle ends when the gas is shut off and the welding contactor opens.

Circle No. 203 on Reader Service Card

Wide-Vision Welding Goggles

New lightweight welding goggles that solve an optical safety problem are announced by National Cylinder Gas Division of Chemetron Corp. The Seeall Series FS-250 goggles have wide-vision angled lens, available in three shades, which eliminate blind spots and lets the operator take in work area with a slight tilt of the head. This relieves neck and shoulder fatigue and brings increased productivity and improved safety. The goggles fit easily over all spectacles, allow indirect ventilation, and have a flexible leather protective nose guard.

Circle No. 204 on Reader Service Card



Stainless-Aluminum Coupling

Project Fabrication Corp. is now offering its metallurgically bonded stainless-aluminum coupling for joining stainless steel pipe to aluminum pipe without flanges or gaskets. Typical applications include transition from stainless steel expansion joints to aluminum pipe lines, stainless valves in aluminum lines, and dewars with aluminum inside shell and stainless or carbon steel jackets.

Transition couplings are designed and manufactured for a service rating not less than the equivalent of 3S aluminum schedule 40 pipe and are available from stock in wide ranges of standard pipe sizes.

Couplings are available in pocket weld-types and in butt-weld-types (shown above).

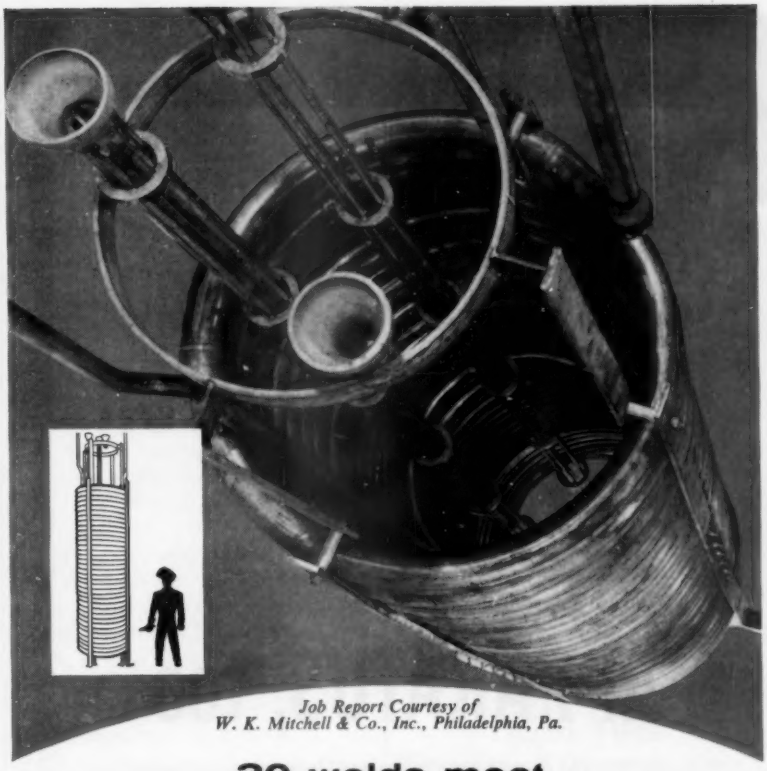
Circle No. 328 on Reader Service Card

Strong Disc Center-Holes

Better surface finishes possible from Michigan Red Coat resin fibre discs are said to result from an improved manufacturing process that strengthens disc center holes. Stronger mounting holes minimize intra-oscillating effects. These result from rapid center-hole break-down when the discs are forced onto out-of-round grinder spindles. Intra-oscillating causes scratch patterns that require extra working time to blend into desired surface finishes.

Developed by Michigan Abrasive Co. the process substantially strengthens the disc's mounting hole by reducing the amount of structural changes in the fibre backing when the hole is blanked.

Circle No. 205 on Reader Service Card



Job Report Courtesy of
W. K. Mitchell & Co., Inc., Philadelphia, Pa.

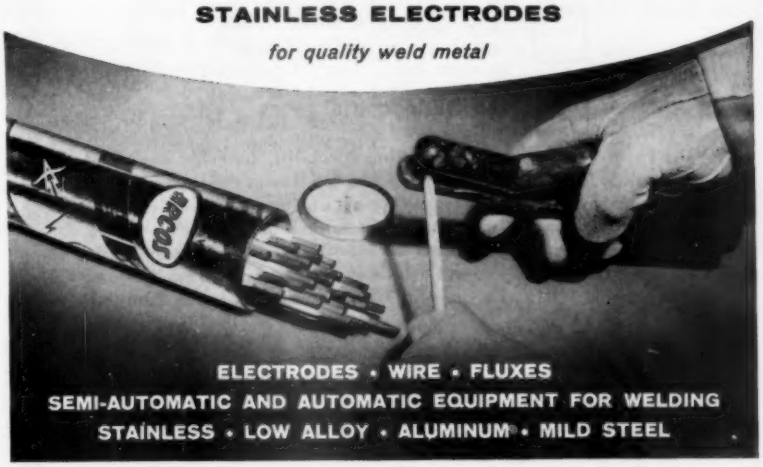
30 welds meet severe bending with no failures

Over 260' of Type 304L stainless tubing (3½" O.D. x 0.300" thick) was welded to form this coil assembly 17' high, 4' O.D. The job originally called for 10 welds. But because the fabricator had to accept random length tubing, 30 welds were required. Arcos Chromenar KLC Electrodes were used to assure needed corrosion resistance and high ductility. All welds met the bend perfectly.

WELD WITH ARCOS

STAINLESS ELECTRODES

for quality weld metal



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- ☐ PUROX apparatus
- ☐ HELIARC apparatus
- ☐ SIGMA apparatus
- ☐ UNIONMELT apparatus
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Your LINDE distributor is a welding specialist, superbly equipped and stocked for immediate delivery of a full line of quality products. To his already extensive list, the *Oxweld* line adds the most efficient high quality gas welding materials available today. There's a LINDE distributor near you. Call him for *all* your welding needs. Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada,* Union Carbide Canada Limited, Linde Gases Division, Toronto.

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Linde UNION CARBIDE

For More Information Circle No. 51 on Reader Service Card.

Tubular Coiled Wire

Ranomatic wire just introduced by Rankin Mfg. Company is designed for automatic and semi-automatic hardsurfacing. The tubular coiled wire is available in four different types for balanced hardness, toughness, and wear characteristics for every surfacing job.

The wire is manufactured with a newly developed process that insures even distribution of alloys, concentric wire, smooth arc, and an extremely fast deposition rate.

Circle No. 63 on Reader Service Card

Aluminum Storage Boxes

Pipe beveling machine storage boxes made by H & M Pipe Beveling Machine Company are now being built from aluminum instead of steel. According to company officials, this reduces the weight by about two-thirds without loss of strength. An added advantage is that boxes require no painting. Nor is there any danger of rusting.

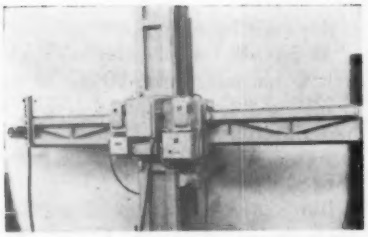
Special fittings hold the pipe beveling machine and torch in place and protect the machines from weather and handling damage. The boxes are made in seven different sizes to hold every model of H & M pipe cutting and beveling machine.

Circle No. 206 on Reader Service Card

High Speed Abrasive Discs

The development of Torro grinding wheels for high speed grinding has been announced by John G. Rollins and Sons. These depressed center discs are practically unbreakable due to their bonding resins and special fibre reinforcement. It is claimed that this construction offers a greater safety factor and much longer life. The wheels are said to be ideal for grinding, cutting off, and polishing. Standard thicknesses are available in both 7″ and 9″ diameters.

Circle No. 207 on Reader Service Card



Ram-Type Manipulator

A heavy-duty ram-type manipulator, the Berkley-Davis "Weldram," is said to be the most rigid unit of its type offered to industry. It comes in combinations of horizontal and vertical travel from 6′ thru 24′ increments.

A feature of the machine is the twin-post construction of the vertical columns. Elevation is controlled by a twin rack-and-pinion drive. A break-motor supplies the power. The ram travel is also rack-and-pinion driven. Power is supplied through a speed reducer and a variable speed DC motor drive.

The controls for the unit are mounted at the front of the ram. They are quickly demountable and can be operated from the floor. Sequence controls for control of the arc can be furnished. The tower rotates 360°; a band brake provides clamping. Brakes also are provided for both the vertical and horizontal motions of the machine. The unit is furnished for floor mounting, with wheels, or with a powered carriage.

Circle No. 208 on Reader Service Card

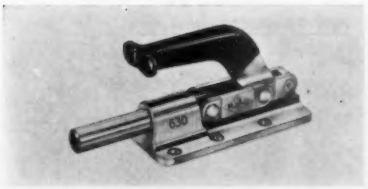
Midget Welder Control

A new welder control designed for resistance welding in the electronic tube and art metal industries has been announced by Robotron Corp. The 21-pound unit is 6 inches wide, 10 inches deep, 10 inches high.

The unit is claimed to be a true synchronous precision bench welder control. The control should prove effective where conservation of space and power distribution sources is vital. It is used on very small welding machines which operate within the limits of a 12-ampere, 50% duty cycle, thyratron contactor with input of 115 or 230 volts, 50 or 60 cycle.

Weld time of ½ cycle, and 1 to 10 cycles, by tap switch is provided; phase shift heat control is adjustable from 20 to 100 percent.

Circle No. 209 on Reader Service Card



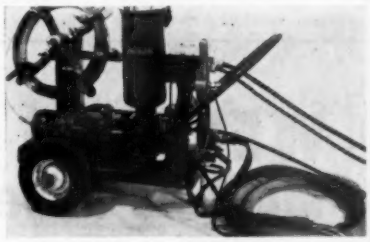
Plunger-Type Toggle Clamp

A new medium-duty plunger-type toggle clamp with a rated holding pressure of 1600 lbs. has been introduced by Detroit Stamping Co. The Model 630 clamp locks in either a push or pull direction. A flared end and heavy Vinyl handle-covering prevents hands from slipping forward into the work when closing the clamp.

The new clamp features a compact silouette for use in confined areas. Height is only 2⅞ inches; overall length in a forward locked position is 7⅛ inches. Plunger travel on a complete stroke is 2-inches.

Irrelac finish resists weld spatter and reduces bearing friction.

Circle No. 210 on Reader Service Card



New Equipment For CO_2 Magnetic Flux Welding

Linde's flexible new Unionarc welding equipment makes welds at high speed, using a bare steel wire as a consumable electrode. CO_2 gas shields the welding arc and carries a powdered flux to the torch nozzle. The welding wire is magnetically coated with this flux as it is fed into the arc, producing continuous welds at high deposition rates. Steels up to ½-in. can be welded in one pass.

The new equipment features a 12-in. diameter coil of welding wire. The chassis is a wheeled-cart for moving the machine. Equipment can be lifted by crane or operated in a suspended position.

A pistol-type and two blowpipe-type torches are available.

Circle No. 211 on Reader Service Card

It's GOOD BUSINESS to DO BUSINESS with your LINDE DISTRIBUTOR because...

Your LINDE Distributor carries a *complete* line of all the welding and cutting equipment and supplies you need in your business. These are products recognized for their outstanding high quality and efficiency. In most instances, he can fill your order *from stock*, to save you time and effort.

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Your LINDE Distributor is as convenient to you as your telephone—call him for all your welding and cutting requirements. If you have not yet made his acquaintance, look in the Yellow Pages under "Welding Supplies." Or write Dept. 330, LINDE COMPANY, Division of Union Carbide Corporation, 270 Park Ave., New York 17, N.Y.

Linde UNION CARBIDE

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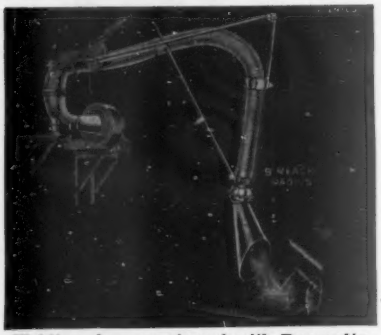
Circle No. 52 on Reader Service Card.

Circle No. 65 on Reader Service Card.

Remove Welding Fumes at the Source... with RUEMELIN FUME COLLECTOR



Welding shops equipped with Ruemelin Fume Collectors are assured of a clean shop atmosphere. Noxious fumes, heat and smoke are eliminated AT THEIR SOURCE. Improves working conditions . . . lessens fatigue . . . paves the way for increased plant production. Especially helpful in winter months when windows and doors are closed.

Note the new spring-loaded counterbalance mechanism which makes Fume Collectors much easier to handle.

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"Jorgensen" and "Pony"

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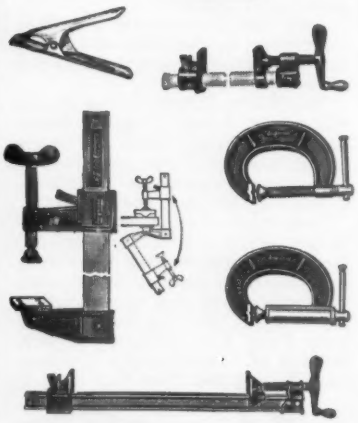

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"the clamp folks"

419 N. Ashland Ave., Chicago 22, Ill.

Circle No. 1 on Reader Service Card.

NEW PRODUCTS *continued*

Extra-Large Gloves

Additions to Riegel Textile Corporation's line include extra-large, jumbo size, spot and heavy welding gloves. The gloves can be obtained with or without linings and are made of the same quality materials as their regular size counterparts.

Circle No. 213 on Reader Service Card

New Hardsurfacing Electrode

A new hardsurfacing electrode developed for carbon steel and austenitic manganese steel parts is being marketed by The McKay Company. Known as Hardalloy "44" the new low hydrogen, composite, consumable type coated electrode deposits a highly resistive surface.

As-deposited, weld metal has Rockwell C hardness from 40 to 45 on C-1020 carbon steel plate. It has a hardness from 33 to 45 on 12-14% manganese plate. These work harder to 52 Rockwell C.

Hardalloy "44" is an all-position electrode operating on AC or DC. It offers a high deposition rate, low spatter loss, and practically no slag. It is recommended for use on equipment subjected to heavy impact and severe abrasion. Each pound of electrode covers approximately 25 square inches, 1/8 inch thick.

Circle No. 214 on Reader Service Card

Box Finger Brake

A new box finger brake with 24" forming width for forming boxes, cabinets, chassis and panels with up to one-inch lip or flange on top or bottom has been introduced by

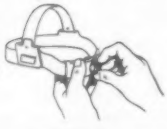
WELDING JOBS *that must be done fast and well,*

now more than ever, need helmets that offer the best in safety and comfort. Of necessity they must be lighter in weight, stronger and stoutly reinforced, non-warping, have higher resistance to heat, adjust easier, fit better and be simpler to clean and sterilize. All these qualities come in good measure when you select Flood's improved Fiber Glass Helmets with new FIT-RITE headgear.

No. 51-8F-2H HELMET

No. 51-2F-2H HELMET | No. 714-8F HANDSHIELD | No. 53-8F-2H HELMET | No. 53-2F-2H HELMET | No. 715-8F HANDSHIELD

INSTANT Head Size Adjustment



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FLOOD SAFETY PRODUCTS CO.

3037 WEST LAKE STREET, CHICAGO 12, ILLINOIS

For More Information Circle No. 37 on Reader Service Card.

O'Neil-Irwin Mfg Company.

The Model 24, a four-in-one machine, performs as a box and pan brake; a bar folder or standard folding brake; a radius former; and an open-end former.

Boxes can be made of 16 gauge mild sheet steel, and a chassis as deep as 3″ and with up to a ½″ lip. The brake has a maximum bending angle of 135 degrees.

Circle No. 216 on Reader Service Card

High Speed Coiler

The new Curvit C-155 Coiler produced by Curvit Division of Maclodyne Corp. rolls 5/16″ to 5/8″ flanges in 30″ OD stainless steel rings at 90 per hour. The coiler can be set up to simultaneously roll and flange in one operation. The flanging attachment develops 6000 psi with an input of 80 psi air pressure. The drive die roller is reduction gear-driven by a 5 hp electric brake motor.

The manufacturer claims this new line will coil pipe, tube, wire, strap flat stock and solid bar stock. Setup is fast and involves three simple operations: installing die rollers, adjusting air-operated radius feed, and setting the coiling pitch.

Circle No. 217 on Reader Service Card

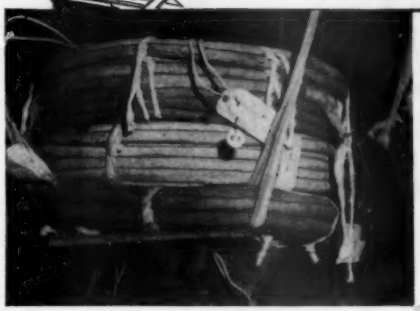
Heat-Resisting Fabric

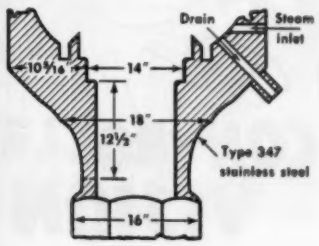
A process for impregnating any fabric with aluminum has been developed by Baxter, Kelly, and Faust, Inc. This process permits the fabric to retain its original shape, strength, texture, and flexibility while making the material heat-resistant up to 2500°F. Tests show this coating keeps out 96% of the heat.

The effectiveness of aluminum-impregnated fabrics will be demonstrated without cost to anyone submitting one yard of cloth for treatment.

Circle No. 218 on Reader Service Card

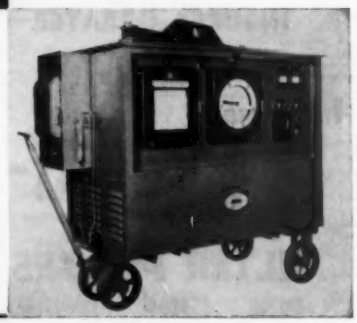
Profit through E.A.I. Research





Uniform, through-and-through heating of the thickest sections of the big stainless steel valves was provided by the Smith-Dolan method, with precision control of temperatures (2-hour dwell at 1900°F.). Drawing shows cross-sectional dimensions.

Standard Smith-Dolan units come equipped with eye hooks and wheels for easy portability, and with instrumentation for recording permanent charts of the heat run.



SMITH-DOLAN On-the-Job HEAT TREATMENT

Solution to Weld Embrittlement Problem at Consolidated Edison

Public utilities are among the largest users of the Smith-Dolan System of Low-Frequency Induction Heating. They want to keep their service uninterrupted, their costs low, and they find that this portable system simplifies the problem of pre-heating and post-annealing in producing sound welds, and in making dependable repairs.

A typical application of the system by a public utility was described in a recent article in Welding Design & Fabrication.* At Consolidated Edison's No. 10 Turbine Generating Station in New York City, two large steam pressure valves made of Type 347 stainless had to be repaired because of weld embrittlement. Removal to the shop for heat treatment would have proved costly and time taking. With the Smith-Dolan portable units, the work was completed on the job within 12 hours.

Learn about the savings and other benefits your company can obtain from the Smith-Dolan System. It is today's most versatile heat treating method, simplifies and upgrades work quality in numerous applications. Write for brochure, "Smith-Dolan System of Low-Frequency Induction Heating."

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Laboratory tests prove Sta-Kleer All-Plastic Cover Lens last longer because they are more heat and scratch resistant.

Triple-Duty Glass Coated Cover Lens outsell all others on the market because they repel molten weld slag. Will not peel or discolor.

THERMACOTE
COMPANY
108 So. DeLacey Ave., Pasadena, Calif.

Circle No. 74 on Reader Service Card.

Automatic Cut-Offs

A series of new automatic cut-off machines has been announced by Vogel Tool & Die Corp. According to the manufacturer, these machines can neatly cut off tubing and shapes into lengths of ½" or more, ± .010" at a high rate of speed.

Machines are designed for either pneumatic or hydraulic operation and are equipped with three cylinders and pistons. One ram clamps the tubing in place. The other two are fitted with shearing blades to make the first and final cuts.

Units come complete with base cabinets. All necessary switches and controls are ready for operation.

Circle No. 219 on Reader Service Card

New LP-Gas Outfit

A new gas outfit designed for use with LP-gas has been announced by Smith Welding Equipment Co. The Big 98 LP is packaged as a cutting-heating-welding-brazing outfit.

A new braze-welding tip does fusion welding up to 14 gauge, according to the company, and brazes any thickness. A cutting tip cuts up to 4" metal with 8" capacity tips available. A mid-range soldering tip and adapter are also included.

Circle No. 220 on Reader Service Card

Circle No. 18 on Reader Service Card.

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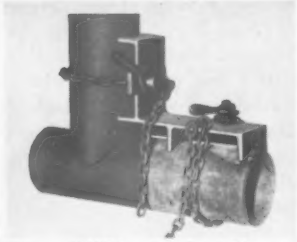


The JEWEL Angle Clamp holds branch line at right angles to the main or headers. Takes any size main or branch from ½" to 12".

The JEWEL Flange Clamp lines up the flange face at right angles to pipe end and holds until tacked. Takes size from 2½" to 16".

The JEWEL Pipe Clamp . . . aligns and holds pipe for tacking. Two sizes: ½" to 8" and 8" to 16". Sturdy construction for hard usage.

The JEWEL Elbow Clamp lines up welding elbows from 2½" to 8" at right angles to the pipe and holds them until tacked.

The JEWEL Pipe Marker marks a perfect hole and saddle on any pipe up to 20".

Write For Details

Jewel Manufacturing Co.

1841 University Ave., St. Paul 4, Minn.

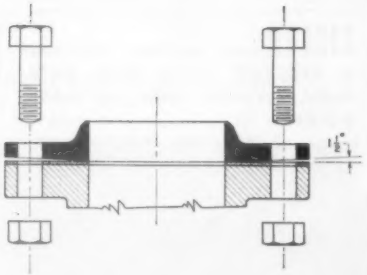
Circle No. 48 on Reader Service Card.

Easy Magnetic Inspection

A new development of Magnaflux Corp. is the packaging of magnetic particle inspection materials in pressurized spray cans and plastic squeeze-bottles. Tests in the field and on complex shapes are made faster and easier with the ready-to-use Magnaflux-Magnaglo materials Many magnetic inspection problems are eliminated. The new sealed dispensers keep out contamination during storage.

The No. 14M Fluorescent Magnaglo Bath and the No. 9BM Magnaflux Bath come in 12 oz. spray cans. The No. 1 Gray Powder comes in one pound squeeze-bottle dispensers.

Circle No. 53 on Reader Service Card



Taper-Face Flanges

Exclusive lightweight carbon steel taper-face welding neck flanges are now available in 14″ through 24″ sizes from Tube Turns Division of Chemetron Corporation. These larger sizes extended Tube Turns flanges from 1″ to 24″. Light wall construction of the new flanges reduces disparity in strength between it and mating Class 125 cast iron flanges, avoiding breakage. A slight taper of the flange face concentrates gasket pressure near the bore, requiring low sealing force. New large sizes are rated for 150 psi WOG service and 100 psi saturated steam. They are furnished bored for Schedule 10 or standard-weight pipe.

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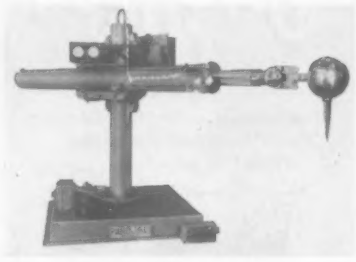

Telescopic Boom Manipulator

A space-saving boom-type manipulator has been announced by Pandjiris Weldment Co. This welding head manipulator is designed to enter small diameter cylinders. Telescoping the horizontal boom saves a 5′ 6″ back stroke, making more space available near the manipulator. The front stroke of the unit is 12 feet.

The boom with the welding head mounted will enter 15″ I.D. pipe. It has micrometer adjustment for angular column rotation. Column rotation is 360° with positive locking mechanism.

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Visible Disc Grinding

Behr-Manning Company has announced a special fiber-backed abrasive disc which gives full view of the work-point. The disc has two parallel straight sides with radius ends. As this disc rotates, a full inch at its outer edge—the area where all disc grinding is done—becomes apparent.

This is said to result in less dwell time, more accuracy, and cooler operation. The Metalite-surface Vizi-Discs are available in standard grit and 7″ and 9″ sizes.

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Magnifying Goggles

Welding goggles that provide improved vision as well as protection from excessive light are announced by The Buell W. Nutt Co. The new

Continued on next page

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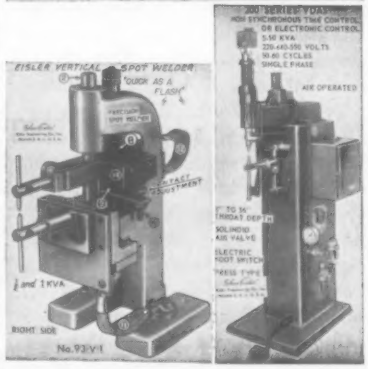

EISLER ENGINEERING CO., INC.
735 So. 13th St., Newark 3, N.J.
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See-Weld magnifying goggles are said to eliminate the use of spectacles and cover-glass goggles while welding.

The correct lens for any operator is selected according to a table based on age; no special eye examination is needed.

Magnifying lenses are also available for use in standard welding goggles.

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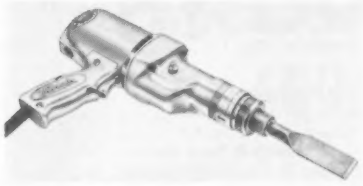

Electric Hammers

A new ½" Electric hammer has been introduced by Milwaukee Electric Tool Corp. This hammer is said to deliver 2800 blows per minute. It weighs 6½ lbs and is instantly adjustable for each new job. A spring-loaded clutch drive absorbs impact shock.

The hammer comes complete with a steel carrying case, 2 chucks, 6 rawl drills, a chisel, and other accessories.

Circle No. 224 on Reader Service Card

Metalworking on Wheels

Lennox Tool and Machine Builders have announced a unique method of demonstrating their latest shearing, forming, and piercing machine. The Bench Model TE-100 is mounted on a two-wheel trailer with swinging sides which open to display literature and samples of the machine's work. The TE-100 is powered with a ½ hp, 115 volt, 60 cps, single phase motor. A conventional supply line allows easy demonstration at a user's plant. The traveling unit is only 8′ long and 4′ wide.

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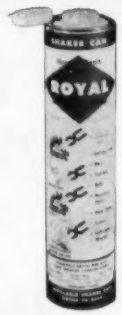
Circle No. 12 on Reader Service Card.

IT'S NEW: SO HANDY



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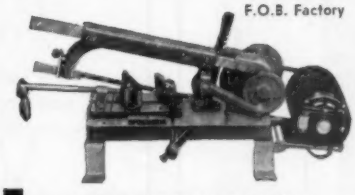

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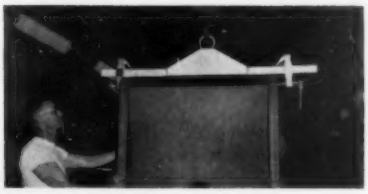

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The 300 amp water-cooled torch is guaranteed not to leak. It is furnished with a chuck that securely clamps electrode wires from .020 to .062 inches in diameter.

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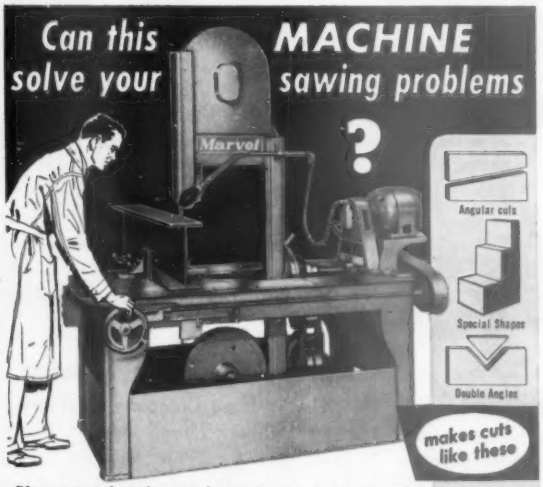

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